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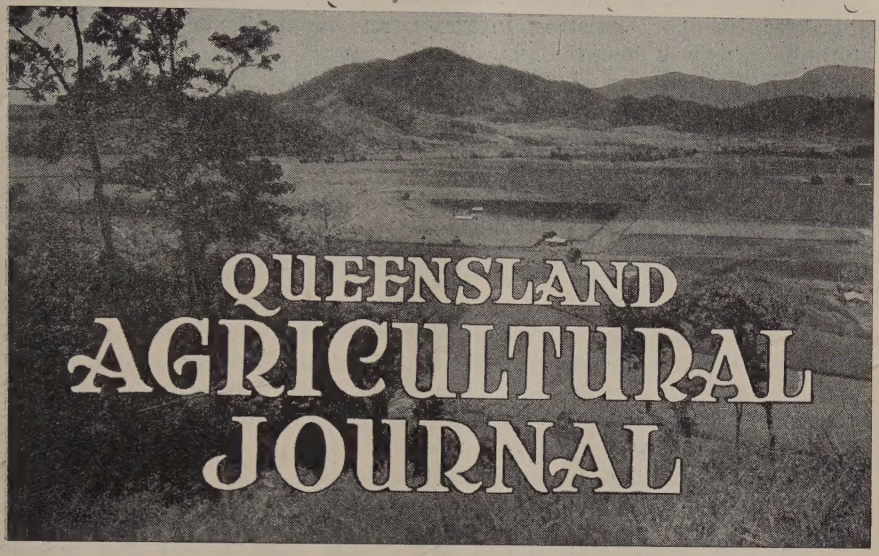

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Event and Comment.

Regional Development—An American Experiment.

THROUGH successive floods, soil erosion, and other causes, destruction and depression came to the once rich region of the Tennessee River Basin—a region about as big as the south-eastern corner of Queensland, with Taroom on, say, its western limit, and with an abundance of mineral and other natural resources. Little had been done to change a rapidly deteriorating situation until about ten years ago, when the Tennessee Valley Authority, known as the T.V.A., was constituted by an Act of the United States Congress. Since then, by flood control, the construction of dams and other great public works, including the provision of cheap and plentiful electrical power, the whole scene has been changed as a result of what has been described as "a unique experiment in regional development"—the sort of regional development constantly in the minds of many Queenslanders with an eye to the possibilities of rural development in this State.

In the present year, the Tennessee Valley Authority has under construction hydro-electric projects which, in addition to electrical power, will provide flood control storage of 15 million acre feet and a 9-foot navigational channel from the mouth of the Tennessee to its upper reaches, 650 miles away.

The Tennessee Valley Authority includes among its general activities the development of agriculture, soil conservation, re-afforestation of cut-over country and other areas denuded of natural vegetation, exploitation of mineral deposits, encouragement of farmers' co-operation in buying, selling, and transport, extension of electrical services to district farms, and general improvement in rural amenities.

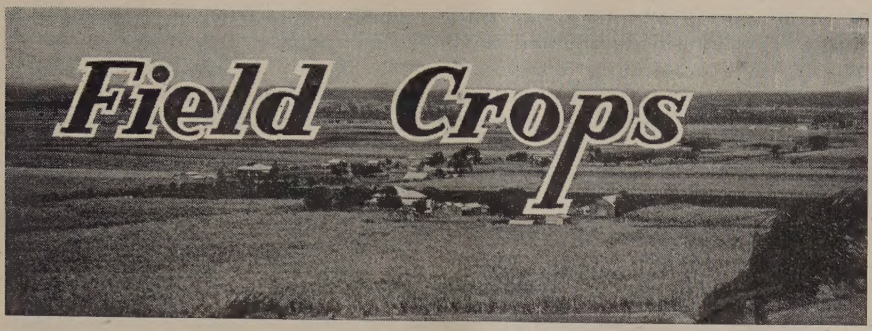
All these things did not come easily. There was the understandable resentment of existing interests, an inevitable corollary to any scheme of reform or progress. In the course of the litigation which followed the inception of the scheme, the principle was established that utilities had no monopoly rights, and that the Government could therefore sell electric power from flood-control dams in competition with private interests. Other difficulties arose, and the majority report of the subsequent congressional inquiry concluded with the statement that "The Authority should be regarded as a settled and established institution in the Valley. Its construction programme should be carried to completion so that the money already invested may not be wasted or inadequately supported by revenue. The agricultural, forestry, public health, and other regional development programmes of the Authority are generally acknowledged to be beneficial to the region and to the nation as a whole and should be continued. The Authority has already demonstrated the value of unified river control under public management. It is on the way to full demonstration of the practicability of promotional rates for domestic electric service which may be adopted as well as by private utilities as under public ownership."

The cost of this experiment in regional development also became a subject of public controversy. It was questioned whether a single authority could deal adequately and efficiently with "such diverse objectives as navigation, flood control, power production, and the many subsidiary activities." On the other hand, the Tennessee Valley Authority was credited with bringing a broad-visioned scheme courageously to the stage of practical achievement. An important factor in its success, however, was that it was commenced during a period of depression when labour and materials were cheap.

In any case, this American experiment, already succeeding in its objects, gives an indication of a new approach to the problems of the land industries, and it may be regarded as a guide, or, at least, as a subject for study when working on our own plans for post-war rural reconstruction.

Among the notable results of the Tennessee Valley Scheme has been the raising of the standard of living throughout the whole region in which it operates. In the scheme there is, it seems, some resemblance to the activities of our own Civil Construction Corps, the operations of which suggest many possibilities in post-war reconstructional planning. In the American example, a remarkable technique in administration has been developed which fits in with that of the local governing authorities in the seven States concerned, and among them there has been a high degree of co-operation from the start. The third annual report of the Authority puts it this way: "The planning of the river's future is entrusted to the T.V.A. The planning of the Valley's future must be the democratic labour of many agencies and individuals, and final success is much a matter of general initiative as of general consent."

As an example of what can be done by real organisation of and within a rural community, the Tennessee Valley scheme is well worth examination by our post-war reconstruction planners—not necessarily for emulation, but for seeing if there is anything in it which may be wisely adopted or adapted.



Grain Sorghums.

C. S. CLYDESDALE, Senior Instructor in Agriculture.

SORGHUMS grown in Queensland may be roughly grouped into three classes—saccharine or sweet sorghums; grain sorghums of which the juice contains little, if any, sugar; and grass sorghums. Of these, it is proposed in this article to deal chiefly with grain sorghums.

In recent years, particular attention has been given to the evolution of dwarf varieties of the grain sorghums which are capable of being harvested by machinery, as is the case with wheat. Success in this direction, by increasing acreage yields and decreasing harvesting costs, has resulted in a great expansion of the acreage cropped with grain sorghums, especially on the Darling Downs. In fact, some yields on the Darling Downs last season were phenomenal, as much as thirty bags to the acre being quite common.

Climatic Requirements.

Sorghums are well adapted to many parts of Queensland, since their requirements for optimum growth are relatively high summer temperatures and a moderate rainfall occurring mainly in the summer. Low temperatures and excessive rainfalls are limiting factors. Frost will kill young sorghum plants, although plants near to maturity display a greater degree of resistance to low temperatures. The effect of frost on the latter may be to retard further development of the stems, but, unless they are very heavily or continually frosted, the leaves will retain their succulence for a month or more, during which their fodder value is maintained. The growth of sorghums, in frost-free areas, can continue throughout a full year and, in the case of some varieties, over a much longer period. Prolonged periods of rain during the growth of a sorghum crop, such as frequently occur in summer in certain tropical areas, favour the development of fungous troubles, particularly leaf rusts, which greatly reduce the value of a crop. Abnormally humid conditions, if experienced at flowering, prevent much of the seed setting and later are apt to cause moulds in the seed heads. Consequently, the growing of sorghums for grain purposes is not recommended under these conditions.

The capacity of the sorghum plant for withstanding dry conditions, which it possesses to a greater degree than any other succulent crop of importance, makes it a particularly valuable plant for Queensland. The young sorghum plants, once established, may remain at a standstill during a dry period of considerable duration, but, when soil moisture is replenished, they will make vigorous growth; whereas maize and many

other summer crops will fail under similar conditions. Although a rainfall that is well distributed through their period of growth is favourable to their maximum development, it is not altogether necessary to obtain a good yield of sorghums. Provided the young plants get a proper start in a moist, well-prepared seed-bed containing a good supply of subsoil moisture they will produce a crop of grain with very little further rain. For fodder or grain, sorghums are consequently of much importance in farming districts of uncertain rainfall, especially where maize and other cereals give unsatisfactory yields.

Suitable Soils.

The soil on which sorghums can be expected to achieve the greatest success is a friable, fertile loam, such as would be considered most suitable for maize or potatoes. Their ability to withstand periods of dry weather enables crops to be obtained, however, on many soils on which maize would fail. Provided there is reasonable drainage, sorghums can be grown on a very wide range of soils, but free-working soils which are easily reduced to a good tilth usually give the most satisfactory results.

Preparation of the Seed-bed.

Although sorghums, as already indicated, display marked ability to grow under dry conditions, they respond to a well-prepared seed-bed containing ample subsoil moisture. It is advisable, therefore, to plough land intended for sorghum-growing early in the spring to a depth which varies with the soil type; in shallow soils ploughing should be from 4 to 5 inches in depth, while in deeper soils with ample organic matter ploughing to a depth of 6 to 8 inches is beneficial. The surface soil should be left in a rough condition to allow of the fullest possible trapping and percolation of the storm rains into the subsoil. Sufficient cultivation should be undertaken after such rains to maintain a clean fallow and to gradually prepare a suitable tilth for the final seed-bed.

Seed.

The use of pure seed of good quality is generally recognised as an important practice in agriculture, and is just as necessary in the case of sorghums as in any other crop. Cross-pollination of sorghums is effected naturally and occurs frequently when two or more varieties are growing in proximity and flowering at the same time. Seed should be obtained, therefore, from a known pure stand that was isolated or grown at least half-a-mile distant from another variety. The seed should be uniformly bright, plump, clean, and free of foreign matter, and should give a full, strong germination; it should be tested prior to sowing.

Time to Sow.

The correct time for sowing the different varieties is largely governed by the climatic conditions likely to be experienced, and the probable length of the period elapsing between germination and maturity.

In inland districts, such as the Darling Downs and the Maranoa, sowings should be arranged to permit the crop reaching maturity before frosts occur, but they should not be carried out too early, as the crop would then mature during the wet season. This applies particularly to crops which are grown for grain and which are to be harvested by

machinery. The grain has no protective covering like maize, and as it readily absorbs moisture the quality will be seriously affected if prolonged wet periods occur when the crop is ripening. Furthermore, the grain would heat if bagged in a moist condition. As a general rule, late November or December sowings will prove most satisfactory.

In coastal districts, sorghums which are grown for fodder are usually sown during January, the crop then being ready for feeding to stock during the later autumn and early winter months.

Sowing dates in Central and North Queensland are governed by the likelihood of rain which, as a general rule, cannot be depended upon until the advent of the wet season, which usually commences in November or December.

Sowing.

The grain varieties are almost invariably sown with a seed drill but the saccharine varieties are frequently sown broadcast, a harrow being used to cover the seed, followed by a rolling, when necessary, to ensure contact of the seed with the soil moisture. When sown broadcast, a sowing rate of 15 to 20 lb. per acre is necessary, the heavier sowing to be carried out on the more fertile soils to encourage the production of fine stems. Broadcast crops are more difficult to harvest and are also more likely to lodge during wind storms than crops sown in drills, and the broadcast method of sowing is therefore not recommended when a seed drill is available.

An ordinary maize planter fitted with a suitable plate is quite satisfactory for sowing small areas, but for large areas a seed drill similar to those used in the wheat areas is the most suitable. The grain runs of a seed drill are spaced 7 inches apart and the desired spacing between the rows is obtained by blocking the required number of grain runs—e.g., by blocking every alternate run a 14-inch spacing is obtained. The sowing rates for a crop sown by a seed drill are given in the following discussion of row and plant spacing.

Row and Plant Spacing.

The correct distance at which to space the rows and the plants in the rows of the different varieties will be influenced by the variety, the soil, and the climatic conditions under which the crop will be grown, and also the purpose for which the crop will be required.

Excellent results are being obtained by some growers who adopt a 7-inch spacing between the rows with the shortest of the dwarf varieties, such as Wheatland Milo, but when this spacing is adopted care should be taken to increase the distance between plants in the rows; otherwise a reduction in the size of the grain is likely to result.

For both grain and saccharine varieties a 14-inch spacing between the rows has proved highly satisfactory on the fertile soils, it being necessary to increase the spacing on the poorer classes of soil. A 21-inch spacing is also very popular, but when adopting this spacing care should be taken to either sow on land which is reasonably free from weeds or arrange to harrow the young crop as soon as the plants are well enough established to stand the harrows. This spacing permits the entry of sufficient light to encourage weed growth, but is too close to permit inter-row cultivation being satisfactorily carried out.

The following quantities per acre and distances between rows are recommended for grain sorghums:—

Row Spacing.	Seed per Acre (lb.).
7 inches	20
14 „	10
21 „	7
28 „	5
35 „	4

Cultivation of the Crop.

When the crop is sown in drills of sufficient width, inter-row cultivation should be practised to aerate the soil, control weed growth, and provide a loose surface to trap moisture.

Single and two-row cultivators, such as are ordinarily used in maize and other row crops, are the most satisfactory for cultivating sorghums. Where the distances between the rows are rather narrow, as in spacings of less than 28 inches, it is advisable to harrow the young crop at right angles to the rows to destroy weed growth. This should be done as soon as the young plants are well established, but it is most important that this be done only during the hottest part of the day and not during dull weather when the plants are inclined to be brittle.

Cultivation between the rows during the early stages of growth may be deep, but succeeding operations in the later stages of development, especially those that are carried out close to the plants, should be shallow so that the surface of the soil is well broken without damaging the roots of the plants. Two-inch cultivator points are satisfactory for the early work, but for the later cultivation broader points, if weed growth is troublesome, should be used.

Harvesting for Grain.

When a crop is grown for grain, harvesting should be delayed until the heads have become thoroughly dry. Grain with more than 15 per cent. of moisture, when held in bulk or bagged, is almost certain to heat and deteriorate rapidly in value.

When the area to be harvested is small the heads are cut from the plants in the field by grasping the head with one hand and cutting the stem just below the head with a short, sharp knife.

The usual method of harvesting large areas is by the combined harvester-thresher, but this, of course, can only be satisfactorily done with varieties of comparatively low height. The evolution in recent years of many dwarf varieties, which do not grow beyond a height that is within easy reach of such a machine, has greatly assisted in this direction. Dwarf varieties permit of close spacing of the rows, so that several rows may be harvested in the one trip of the machine. Pure stocks of such varieties produce a very even growth which ripens early and uniformly, and when mature it presents the appearance of a level floor of heads like a wheat crop.

The mechanical harvesting of grain sorghums is practised very extensively in Queensland, and no trouble whatever is experienced in successfully harvesting a number of varieties now in general cultivation, the only adjustments necessary being a slight reduction in the threshing speed and an increase in the spacing of the combs.

Where a thresher or a harvester-thresher is not available for harvesting the crop of grain, satisfactory results can be obtained by threshing the harvested heads with a hackler of the type used for stripping the seed out of the heads of broom millet. When a hackler is used it is necessary to cut the heads off with long stalks in order that they may be held against the hackler drum with safety to the operator. Threshed seed should be well cleaned over a screen or with a blower, because a considerable quantity of broken parts of the seed head is generally beaten off with the seed.

The plant with the heads removed when cured is termed stover. As the grain is thoroughly matured when harvested the feed value of stover is low. In times of scarcity, however, it is of some use in providing bulk when a protein concentrate is fed.

Yields of Grain Sorghums.

From the grain varieties, yields in the vicinity of 60 bushels of grain per acre are frequently obtained under favourable conditions, while under average conditions yields of from 30 bushels to 40 bushels per acre can be expected.

Experiments which have been conducted in a number of districts in which the rainfall is too unreliable for maize growing to be profitable, have demonstrated the ability of several varieties of grain sorghum to outyield maize in those districts.

Grain Sorghum Characteristics.

The grain sorghums, because of their pithy and less succulent nature and their generally lower yield of green fodder, should not be grown in preference to the saccharine varieties, either for feeding in a green state to dairy stock or for converting into silage. They are, however, grown very extensively in some districts for grazing with sheep, the sheep being turned in on the crops when the grain has formed but while the leaves and stalks are still green. Their use in this way is now very popular. During the early stages of growth a prussic-acid-yielding glucoside is present, and great care should therefore be exercised when stock are allowed access to a crop. The outstanting merit of the grain sorghums lies in the generally large yield of grain in which the total digestible nutrients closely approximate those of other cereals.

Sorghum grain is the staple food of millions of the world's population, chiefly in Asia and Africa. As a food for stock, its value is apparent, the nutritive ratio being narrower than that of maize, as shown by the higher protein content. Except for sheep or poultry, it is advisable that sorghum grain be crushed to allow of complete digestion, although it may be fed in the head to animals. Combined with a legume, such as lucerne or cowpea, or a protein concentrate, such as linseed cotton seed, or peanut oil-cake in suitable proportions, sorghum grain may be economically fed to all classes of stock for milk production, growth and fattening. When harvested with a combine, the production or sorghum grain will be at a cheaper rate than is the case with maize.

Grain Sorghum Varieties.

So many varieties of grain sorghum have been developed by selection and artificial cross pollination that in many cases difficulty has been experienced in associating them with one or other of the accepted types, such as durra, milo, kafir, and kaoliang.

The first name, durra, which is the Egyptian name for sorghum, was applied to the grain sorghums commonly cultivated in Egypt and in the Anglo-Egyptian Sudan, and it includes the well-known group of varieties known as Feterita. The origin of the milo type is unknown, but the name "milo" originated in the United States of America for an importation from unknown sources. It is thought that milo may be a product of North and North-West Africa and the kafir varieties of Central and South Africa. The kaoliangs are of Chinese origin, the name being that applied to the crop in China.

There are several varieties of Feterita, differing somewhat in height and period of growth to maturity. They usually grow to a height of from 6 to 8 feet. The seed head is erect, 8 to 10 inches long, and is somewhat flattened or wider in one direction than in the opposite one, especially at a third of its height when it tapers off to the tip. The seed is generally larger than that of other varieties of sorghum, is greyish-white in colour, slightly flattened, with glumes light to dark in colour, and frequently tinted with pink. The Feteritas yield well and some are valued for their earliness of maturity. The variety commonly grown in Queensland is favoured by farmers for grazing with sheep more than most other grain varieties.

The period of maturity varies from approximately 75 to 120 days, according to climate, season, and variety.

The milos are distinguished by sturdy stalks, good stooling capacity, abundant foliage, and generally large compact seed heads which are short and cylindrical rather than long. The weight of the seed head in some varieties tends to form a gooseneck which is most undesirable. Standard milo varieties grow from 5 to 7 feet in height, and those of dwarf habit from 2 feet 6 inches to 5 feet. According to climate, season, and variety, maturity is reached between 80 and 130 days.

Plate 28.

DAY MILO.—An early grain-producing type suitable for planting in the drier districts.

Plate 29.

KALO.—A kafir-milo hybrid that has produced heavy yields of grain in all districts in which it has been grown.

Plate 30.

TEXAS BLACKHULL KAFIR.—A variety that has given great promise in trials.

The kafirs present perhaps a greater diversity of growth than do those of the preceding types. In some varieties the foliage is heavy and abundant, whereas in others it is somewhat sparse. They do not appear to be so adapted for grain production in the hotter, dry climates as do the milos. The seed heads are much longer than are those of the other types, being 9 to 14 inches in length; they are erect, somewhat cylindrical, and moderately compact; a height of 6 to 8 feet is usually attained. The period of growth is similar to that of the milos.

Varieties of the kaoliang type have never become popular, as in yield of fodder and grain they are inferior to the best of the other types. Their stalks are slender, and are inclined to be dry and pithy, with few and narrow leaves; they grow to a height of from 6 to 9 feet. The heads are ovate, erect, a little more open, perhaps, than in the kafirs, and from 6 to 10 inches long.

Of the varieties of milos that have been grown for some time, Wheatland Milo gives good results on the Darling Downs and in western districts for grain production to be harvested by harvester-threshers. Day Milo (Plate 28) is a variety well suited for grain production on the poorer soils and can be satisfactorily harvested by machinery. The Kalo variety (Plate 29), which is considered to be a kafir-milo hybrid, has given very good results in every district in which it has been grown and is one of the most popular of the dwarf varieties. It is slightly taller than the two milo varieties just mentioned, but it produces a large bulk of foliage, as well as being first in yield of grain. Hegari is also a very popular variety and has given highly satisfactory results in many districts. Like Feterita it is one of the most popular of the grain varieties for grazing with sheep.

A large number of varieties new to the State have been introduced in recent years. In the preliminary trials some of them have yielded well (Plate 30) and it is possible that the best may eventually prove to be more valuable than some of the older varieties just described. As superior varieties are discovered through the comprehensive set of trials being conducted annually by the Department of Agriculture and Stock commercial supplies of seed will be developed for general distribution.

As the investigational programme will doubtless disclose differences in varietal suitability for the various soils and climates of the districts wherein sorghum growing should be profitable, it is suggested that enquiries be made of the nearest appropriate officer of the Department of Agriculture and Stock or of the Head Office at Brisbane for advice regarding the most suitable variety to grow.

Birds and Sorghums.

All grain-eating birds are particularly fond of sorghum seed, and they frequently devour the whole of the crop of seed produced on areas under 5 acres in extent. Where large areas are grown, however, the loss from this cause is negligible; some loss must, of course, still occur, but where the sorghums are extensively grown the loss by bird attack is spread over a very much larger area and the loss per acre is not noticeably high. In the dough stage of the seed, sparrows are most attentive, while later, when a degree of hardness obtains, parrots may be very destructive.

Sorghum Grain Storage.

Considerable care has to be exercised to ensure the safe storage of sorghum grain. Among the most important possible sources of loss to be guarded against are excess moisture in the grain when it is stored, damage by weevil attack, and loss through the depredations of mice.

Unless the grain is thoroughly dry it is liable to heat, and it deteriorates in value if kept in bags or in a larger bulk. However, where care is exercised in harvesting or in drying out the heads before theshing, the grain will usually be dry enough for safe storage. Sun drying, if the grain is thinly spread, is a fairly rapid method for reducing the moisture content of such small grain.

Weevils, especially in the warmer parts of the State, can be very destructive in sorghum grain, if precautions are not taken to prevent infestation by them.

Loss from attacks by mice can be best prevented by storing the sorghum grain in tanks, or by preventing the ingress of the rodents to the barn if the grain is stored in bags.

THE PRESERVATION OF CONCRETE ON THE FARM.

Concrete floors and feeding troughs on the farm often show signs of wear soon after being laid down—a fault which is often due to the action of various acids in milk and some other foods. If a farmer does not do something to prevent further wear, the concrete becomes pitted and quickly breaks up.

This deterioration of the concrete may be delayed successfully by the correct use of a special type of silicate of soda, which is cheap and easy to apply. When mixed with water the solution thus obtained is sprinkled on the surface of the concrete to be treated, is absorbed, and combines with the concrete, forming a tough coating which is impervious to water and acids under ordinary farm conditions.

One gallon of the special silicate of soda is thoroughly mixed with 4 gallons of water. The 5 gallons of solution will suffice for three applications to an area of 300 square feet of average concrete. Very dry or porous concrete will require a fourth application.

In making new concrete floors, the work should be finished off so that the surface is not very smooth; otherwise the stock will be liable to slip when it becomes wet. When the concrete is firm and nearly dry the solution of silicate of soda in water is applied by means of a spray pump, a watering can with a fine sprinkler, or a mop. Do not flood the solution on, but apply just as much as the concrete can absorb readily. A second, and later a third, application of the solution should be made as the surface dries out each time. For new concrete, three coats should be sufficient.

Worn floors and troughs may be renovated in the following manner:—First, the surface should be thoroughly scrubbed with soap and hot water to remove grease and dirt. Then the area is coated over with a mixture of one part cement to three parts clean, fine sand. When the concrete is firm and drying, treat with the silicate of soda solution as for new concrete.

Floors and troughs in sound condition will benefit by treatment with silicate of soda. The surface should be freed from grease as before mentioned; four applications of solution will probably be necessary, and twenty-four hours after the last application any solution remaining on the surface should be removed with a mop.

Concrete floors and troughs treated in this way last longer, are easier to clean, and dry more quickly than untreated concrete. For best results, the concrete should receive a light treatment once each year following the initial treatment.

When purchasing silicate of soda for conditioning concrete, farmers should definitely state the purpose for which it is to be used to make sure of obtaining the right material.

Cotton Breeding.

R. W. PETERS, Research Officer.

COTTON presents more problems to the plant breeder than probably any other agricultural crop. Not only must the cotton plant have the ability to yield satisfactorily under a wide range of environmental conditions, but the fibres it produces must be able to fulfil the many exacting requirements of the cotton-spinning industry.

Probably one of the most difficult problems with which the Queensland cotton breeder has to contend is the effect on the cotton plant of the unusually high nitrate content of the cultivated alluvial and some of the scrub soils in the cotton-growing districts, particularly when the cultivation has extended over a number of years. This soil condition demands a type of plant that has a sufficiently large framework to carry a profitable yield; at the same time it must also be of an open habit of growth, with a minimum number of vegetative branches, especially large spreading basal branches. Cottons for such soils must also have the ability, after experiencing any setback which may cause serious shedding, to develop a crop quickly instead of making excessive non-bearing new growth as so often happens after such a setback.

The possibility of a lack of early spring rains is always present. When this occurs, the planting of a quick-maturing cotton is essential to allow of a profitable crop being harvested before severe frosts are experienced. Where jassid resistant varieties are not available, it is also advisable to have quick-maturing varieties for late plantings, in order that a good crop can be developed before a severe jassid attack builds up. The cotton breeder in this State is therefore always searching for suitable early maturing types. Quick-maturing cottons are usually of the medium to small boll type, however, and in Queensland, where picking costs are relatively high, it is essential to produce a good-sized boll, which, while remaining storm-proof, will still pick easily. There is also the tendency for very quick-maturing varieties, when planted early, to bear so heavily by mid-season that severe shedding of much of the crop of flower buds and small bolls occurs if stress conditions are then experienced. It is thus necessary to guard against developing strains that lack the ability to withstand dry periods during critical stages of plant growth.

It is not sufficient, however, for only the habit of growth of the plant and the boll characters to be satisfactory. Factors such as uniformity of the length, strength, maturity, drag, and character of the fibres; as well as the percentage of fibres contained in the seed cotton,

the lint index—the amount of fibre per seed—and the amount of fuzz on a seed and the colour thereof, all have to be studied in determining the merits of a cotton plant.

The jassid, which is a small leaf hopping, sucking insect, has in recent years become such a major pest that in many districts the top crop of cotton has frequently suffered severely from attacks by it. Ordinary entomological controls proved unsuccessful and it became evident that the only method of combating this pest was by breeding a strain which is more or less immune to it. This work is now in progress on a comprehensive scale and promising results have already been obtained.

Cotton Breeding Methods.

The examples that have been quoted are presented to indicate some of the many problems confronting the cotton breeders in this State. Two main methods of cotton breeding are being used to solve them. One, which is known as selection, consists of isolating and propagating superior plants of the type desired that occur in the commercial varieties grown here; the other method, which is known as hybridization, consists of crossing two varieties with the idea of combining in one plant the desired qualities of the parents.

Selection Methods.

Selective breeding may take the form of either mass selection or individual plant selection. Mass selection is the simplest form of the selection method, and is of considerable value where an improvement of the general suitability of either an old deteriorated or a newly-introduced variety is required, or where it is desired to maintain the existing standard of a satisfactory variety. In this work the plant breeder decides upon a definite type of plant having certain fibre characteristics as being worthy of propagation. Plants in a field of the variety to be improved are individually examined and those conforming to the desired type are tagged, harvested, and ginned. The seed obtained is planted the following season under isolation from other cotton and when the bolls commence to open, any off-type plants are eliminated. New selections are again made for next year's planting of an isolated plot for further purification. In addition, the seed of the residue plants of the first mass selection plot is saved for planting a multiplication plot in the next season. This increase eventually replaces the parent commercial stock, and in turn is itself replaced by a purer stock obtained from later mass selections. If this method is continued for a number of years a fairly uniform product is finally obtained.

The selection of individual plants followed by row to row testing is the method usually followed by plant breeders when some particular plant type is desired, or a high degree of uniformity of special characters is required. Plant to plant examination is made in a field of some variety which exhibits the desired characters, as in mass selection, but in this case mainly selections are taken which definitely conform to the required type. Some plants may be found, however, that, while not of the desired type, have such a good combination of characters that they appear worth testing. In addition, occasionally a "mutant" or completely new form which breeds true for certain characteristics not possessed by the parent strain may be found.

As a cotton breeder walks along rows of cotton in search of outstanding plants to select, any plant which, at first glance, appears

promising is examined in detail for all of the characters which have already been described. Usually only a few plants are chosen each day that measure up to requirements. These are carefully tagged for further pickings, and a plant description is then made of each one for future reference. Each one is then picked separately and at the end of the season all cotton obtained from each selected plant is forwarded to the laboratory for detailed studying of the fibre and seed characters. The seed cotton of each selection passing these tests is then ginned separately, to enable the lint percentage and lint index to be calculated.

In the following year, seed from the selections retained for further testing is planted in a progeny row test, which usually consists of 50 plants of each selection. During the growing season each row in the progeny plot is carefully examined at different periods to study the development of the plants. When sufficient bolls per plant are open, the most uniform and attractive appearing progenies are carefully examined plant by plant to determine the merits of the important fibre and boll characters. If one of these progenies exhibits a high degree of uniformity in such characters, it is picked in bulk for planting a progeny increase plot and also to supply seed for use in the following season in strain trials with similar progenies and the main commercial stock of the parent variety. If, however, a progeny is variable, the most promising plants may be taken for further testing, but when the variability is too great the whole progeny is discarded.

From the results of these strain trials together with the final test of the increase plots and the laboratory examinations of the fibres, the fate of the progenies is decided. The laboratory examinations at this juncture are made of fibres from one boll per plant taken at comparable positions on consecutive plants in each of the leading progenies and in the parent stock. The examinations consist of again testing the uniformity of length of fibres by passing them through a Baer Sorter, which assists in segregating the various lengths, and thus allows their being calculated as percentages of the whole.

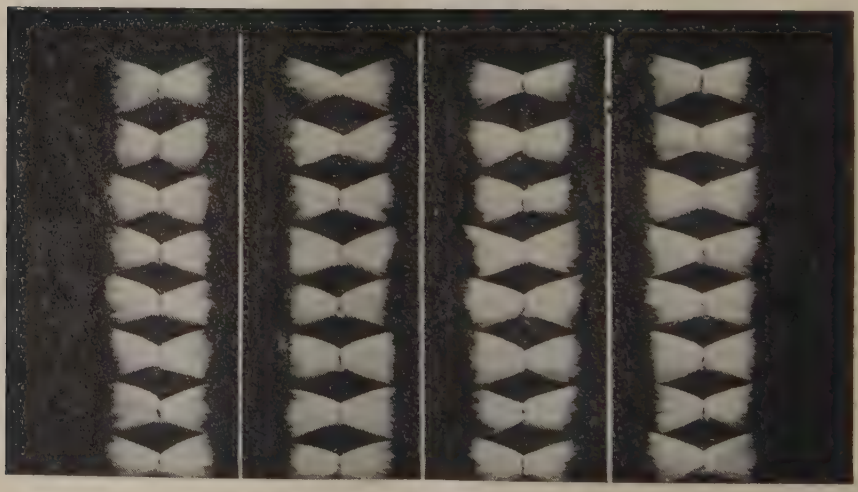


Plate 31.

Combings to illustrate the degree of uniformity which may be obtained in a few seasons by means of the mass selection method. A combing represents one boll per plant collected from comparable positions on successive plants.

Under the varying climatic conditions that exist throughout most of the Queensland cotton belt, strength is a character that it is most essential to maintain. For this reason fibres from each progeny are also treated with an 18 per cent. solution of caustic soda, which reveals the mature, immature, and dead fibres in a sample. If the percentage of dead and immature fibres of a progeny exceeds the parent stock, it is rejected.

If any of the leading progenies surviving these tests are considered to be an improvement on the commercial variety, they are planted as small commercial increases in the following year, and also are included in another strain trial with the parent stock. If the leading progeny at the end of the second season of testing is considered to be of a higher standard than the commercial stock of the variety, it is multiplied for testing in commercial plantings over a range of soils. If satisfactory results are obtained there, it is then increased as quickly as possible to replace the commercial stock which is consigned to the oil mill.

Cotton Breeding by Hybridization.

The improving of a variety by either mass selection or individual plant selection obviously requires that it will be possible eventually to obtain the desired type from the parent stock. When it is known that the desired type does not occur in an otherwise satisfactory commercial variety, it is necessary to evolve a strain which will have all of the desirable characters of the commercial variety and also the desired special character, such as immunity to a disease or possibly an insect. Hybridization of the commercial variety with a less suitable variety having the required immunity is employed by the cotton breeder in such instances.

An article describing how the development of jassid resistant varieties is being undertaken in Queensland through the use of both methods of selection as well as by a programme of hybridization will shortly appear in this publication.

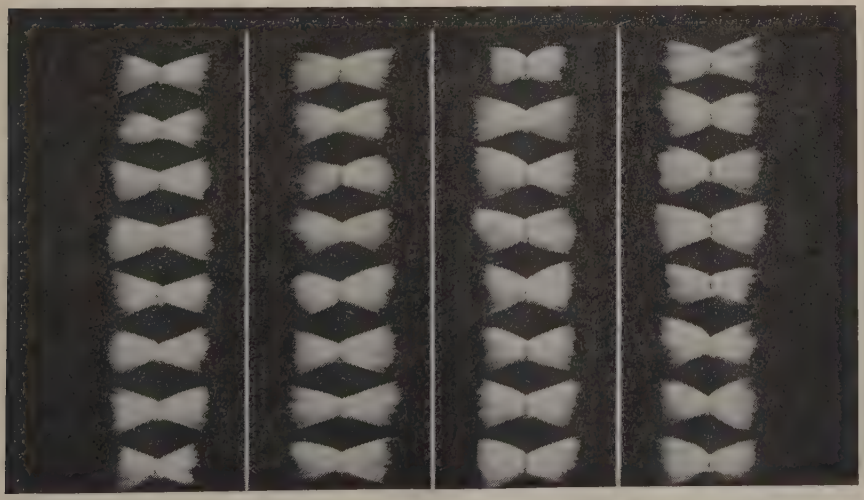


Plate 32.

Combings to illustrate the degree of diversity which may occur in a variety when no method of maintaining a satisfactory standard of uniformity is practised. A combing represents one boll per plant collected from comparable positions on successive plants.

Pure Seed Supplies.

Cotton is an easily cross pollinated plant, and strict precautions have to be taken to reduce all chances of contamination occurring between varieties. It is necessary, therefore, to isolate a variety producing seed for planting purposes, by at least half a mile from other cotton, and also to plant on land where cotton was not grown in the previous season. The greatest care is likewise necessary at the ginneries to prevent an admixture of seed in any of the operations connected with the saving of seed for planting purposes. It is obviously advisable, therefore, to have only the minimum number of varieties necessary to meet all growing requirements, and wherever possible to develop a district on a one-variety community basis. This is being attempted in all cotton-growing countries for it has been demonstrated that not only is it advantageous in maintaining the purity of the variety, but it also assists materially in developing sound cultural practices and in marketing the crop. Any variety of cotton will deteriorate rather rapidly, however, unless the purity of the type is maintained by carefully conducted breeding operations which embrace a system of replacements of pure stocks for every variety grown. The breeding system carried out in Queensland aims at a replacement with pure seed after the stock of any variety has reached its fourth or fifth year of commercial multiplication. By so doing it is expected that it will be possible to maintain a good standard of quality in each commercial variety developed to meet the requirements of the cotton growers and the Australian spinning industry.

Plate 33.

WATER CONSERVATION ON THE LOCKYER.—A weir in course of construction.

Custard Apple.

H. BARNES, Director of Fruit Culture.

THE Custard Apple or Cherimoya was first grown in Queensland from seeds introduced from South America, and the excellent type which has since developed was derived from one of the first seedlings. It is generally catalogued as Mammoth or Pink's Prolific, and has but few seeds. Another variety known as Island Beauty is a vigorous grower producing excellent fruit. The Bullock's Heart, comparatively smooth skinned, is also popular.

Soils.

Deep, fertile, and well-drained loamy soils are best for custard apples. Planted on shallow soils over impervious subsoils they are not successful. The tree is semi-deciduous and new growth is subject to injury by severe late frosts.

Propagation.

Seeds are sparse in the best varieties, and are often infertile. The seeds which do germinate cannot be relied on to produce true to type, consequently budding and grafting are necessary. Herbaceous or side-

Plate 34.
A Custard Apple (Cherimoya) Tree, Redland Bay, near Brisbane.

cleft grafting is usually practised. Budding is only moderately successful, but may be applied with advantage to unprofitable trees which are being worked over. In selecting scions, the more mature parts near the base of current year's growth are recommended.

Plate 35.
CUSTARD APPLE FRUIT (MAMMOTH).

Planting.

Trees should not be transplanted before the middle of August, and planting may proceed from then until the middle of September. In no circumstances should the soil in the vicinity of young trees be fertilized at the time of or shortly preceding planting. The young roots are very sensitive, and the action following contact with fertilizers has been the

cause of many failures. The distance apart at which trees should be planted varies according to local conditions (mostly of soil), and where it is improbable that upwards of 30-foot spaces would be fully occupied by developed trees, planting is not recommended. Under the most favourable conditions 40 feet is not excessive.

Pruning.

The tree being of rather straggling habit, more pronounced in grafted than in budded specimens, systematic pruning may be applied. For the first three or four years this should be fairly severe and afterwards modified with increasing age, according to development. Being of a pliant nature the shoots or branches, if allowed to grow unchecked, adopt a pendulous or loose habit with more or less of the extremities resting on the ground. Where attempt is made to rectify the position by the removal of the lower placed limbs, the next in succession usually droop and replace the limbs already removed. At planting, the young tree should be topped at not more than 30 inches (24 inches is a fair average) from the ground level, and a single fork formed by two lateral branches allowed to grow for the first season, these in turn being shortened to within about 9 inches (dependent on their vigour) of their bases. Two or more shoots from each "arm" usually develop, of which two should be allowed to remain, and these in turn should be shortened to about 12 inches in the following season. Similar treatment—the duplication of branches from short "arms"—should be applied the following year. Subsequently shortening may be less severe and lateral branches may be encouraged, but these should be shortened sufficiently to ensure rigidity, and thinned to prevent overcrowding.

Pruning the mature trees consists of cutting back those branches resting on the ground, the removal of branches inside the tree which cross and tend to crowd the centre excluding light and air, and the shortening in by one-third to one-half their length of the whip-like terminal growths on the outside of the tree. Early pruning is considered detrimental, and consequently pruning should not be done until the first rise of sap in the spring is perceptible. Pruning before the first rise of sap often results in shy-bearing. The habit of fruiting differs from that of most deciduous trees in that the fruit is produced on the growth of the current year as well as that of the previous year.

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Vegetable Production

Vegetable Marketing in Queensland.

JAS. H. GREGORY, Instructor in Fruit Packing.

THE vegetable industry of Queensland has expanded considerably during recent years. While regulation of market conditions has kept pace with expansion in the fruit industry this is not so with vegetables, and lack of suitable standards is often the reason for the forwarding of poor packs to market. Containers have been improved to some extent, but as is probably natural when quality and sizing standards are left to individual producers, quality often shows a considerable variation and this variation is the cause of a wide range of values and market price fluctuations, which makes supervision and checking of sales difficult. It is in the producer's interest to observe regular standards of quality. Experienced growers find no difficulty in maintaining high standards by careful grading and packing. To assist other growers to achieve similar high standards the following hints on the marketing of vegetables are given.

Markets.

Because of advantageous climatic conditions, Queensland vegetable growers have a wide choice of markets. Different modes of transport and types of containers facilitate compliance with the varying requirements of both local and distant selling centres. No matter to which market vegetables are sent, however, the quality of the consignments is of paramount importance in making quick and satisfactory sales.

For distant markets, produce should be consigned in perfect condition, or as near that condition as may be attainable. Even the best of produce may develop defects in transit, so, obviously, faulty second-grade consignments are less likely to open up satisfactorily on delivery. A faulty line which returns, say, 60 per cent. of the value of a quality line costs the same to send; therefore, it is not good business to send any but the best produce to faraway markets.

Methods of Packing.

The Local Market.

For local markets, root vegetables are usually handled in bunches of twelve. Under present conditions, rising prices have sometimes resulted in a demand for smaller lots. Of large root vegetables, it is advisable to reduce the quantity in the bunch from twelve to six to facilitate handling. Sugar bags or corn sacks are used for carrots, parsnips, turnips and sweet potatoes and other vegetables, the tops being removed before bagging. Corn sacks or chaff bags are used for leaf vegetables, such as cabbages and cauliflowers, although they are also marketed loose when road transport to market is practicable. No doubt when timber again becomes available small crates will largely replace bags.

Distant Markets.

Bags or boxes are always used to convey vegetables long distances. Corn sacks are usually used for cabbages, cauliflowers, carrots, parsnips, sweet potatoes, and pumpkins. Peas and beans are generally marketed in a special type of bag; beans are sometimes packed in boxes also. Boxes are best for cucumbers and marrows for long distance consignments.

Branding.

Regulations provide that all produce should have the name and address of the grower, and the type or variety of produce, branded clearly on the containers. The outside of a bag may be stencilled before it is filled. The weight of the contents should also be marked on the bags, or on an attached label strong enough for the purpose. The selling agent's brand should also be placed on both sides of the bag, to save extra handling. If cases are used, the agent's number should be branded on both ends of the case. This facilitates handling, and on interstate markets may also mean the difference of a day or so between sales, a matter of particular importance during hot weather.

Handling Produce.

The necessity for care in handling all produce cannot be overstressed. When packing bags and boxes, the filled containers should be stacked in such a way as to ensure complete protection of the contents from damage by pressure. Filled bags or boxes should not be used as seats, or as supports for other freight. All produce should be protected from heat after picking and packing. Close attention to these details is particularly necessary for the successful marketing of vegetables at distant places. Produce sent in bulk direct to a local market need not, however, be pre-cooled.

Everything practicable should be done to prevent damage to vegetables during harvesting, as damaged produce becomes second grade

Plate 36.

Produce Left Over After the Market Had Closed.

immediately, besides being exposed to the possible development of disease which may spread rapidly throughout the pack, with resultant loss to the grower.

Beans.

The usual method of marketing beans is by sugar bag or similar container. Because of their close weave, sugar bags are not, however, quite satisfactory when beans have to be conveyed long distances. The so-called "bean bag" with its open mesh is more desirable. Onion bags are too open-weaved for satisfactory use, the beans working through and sticking out like quills on a porcupine and so becoming easily bruised or broken. For long distance carriage, the tropical fruit case—24½ inches long by 12 inches wide by 12 inches deep—is satisfactory, a half-tropical case equally so.

If practicable, beans should not be picked during the heat of the day. If unavoidable, however, packed cases should be space-stacked without lids in a cool place, the cases being topped off when lidding. Beans intended for bagging should be spread out to cool before being bagged. Filled bags should be handled carefully and the contents kept dry. Wet beans stacked in bulk generate heat and soon deteriorate. When packing beans in boxes, care should be taken to place the pods side by side to prevent bruising and conserve carrying quality. The easiest way of doing this is to "square" the pods off while picking. For picking, a useful container is a tin or box, 6 to 8 inches in width by up to 18 inches in length by 8 to 12 inches in depth. The tin should be fitted with a folding handle so that the beans may be easily removed while packing. When picking beans, the pods are usually placed across the picking container, but with extra long varieties they may be placed lengthwise, so that the beans may be quickly removed in hand-fulls when packing. This method of harvesting and packing is much easier and faster than haphazard gathering. If practicable, all damaged, short, and misshapen pods should be rejected when packing. When packing in cases it is the practice of some bean growers to immediately cool the beans after picking by immersing them quickly in water, and then allowing them to dry before packing. With this practice, however, the utmost care in handling is necessary to avoid the risk of mould development and "nesting" of the beans after packing. Weather conditions and the maturity of the beans at picking are important factors. The younger the beans and the more hot and humid the weather, the greater the risk of damage. It is only the experienced grower who is able to successfully use this method of handling, as it is still largely experimental. Less experienced growers should take every care if they are to successfully deliver to distant markets.

It is the condition of the beans on delivery that matters. During warm, humid weather, even a small amount of damage through careless or inefficient handling may develop into a condition serious enough to prevent the profitable sale of a consignment, if not to destroy it entirely. Observation of the growth of different plantings will help in assessing the quality of the resultant crop. Beans from picked-over areas should be kept separate from a newly-matured crop. Boxes should not be lined with paper, as free ventilation is necessary. When filling bags with beans, the same principle as for filling boxes should be observed if practicable. A small fixture or frame for keeping the mouth of the bag open will make filling easier. Old and damaged pods should be rejected, and diseased beans should, of course, be rigidly excluded from the pack. Various types and grades should be kept separate. Only first grade pods should be packed for long distance carriage.

Cabbage.

To obtain top market price, vegetables should be presented attractively, showing their original freshness; this applies particularly to cabbage. Cabbage grown in the vicinity of markets is usually transported in bulk and then stacked in heaps of different sizes on the selling section. During rush periods, however, a whole load is often placed in a single stack, irrespective of size of individual heads. This practice makes it difficult to assess values. The highest prices are usually paid by the country order buyer and his requirements should be studied accordingly.

Growers are advised to pack all first-grade cabbage in chaff bags. Cabbages should be cut (not pulled), preferably in the early morning. All slightly diseased or insect-damaged heads should be excluded from first grade lots. The culled cabbage may be marketed in bulk, if necessary. Any surplus or damaged outside leaves should be carefully removed. Not all the outside leaves should be removed, however; some should be left on each cabbage to protect the heart Seedy or split heads should not, in any circumstances, be mixed with quality lines, as they are classed as third grade at best. Soft-headed cabbage should be packed separately. If a sufficient quantity is available, cabbage may be classed into four lots of approximate size, each size being packed separately. If a cut is very even, two classes may be sufficient. Many troubles may be avoided by careful cutting. Bags should be well filled, with stalks downward and outward at the bottom and sides of the bag, respectively, to prevent bruising or crushing of the softer portions of each heart.

When filled, the number of heads in the bag should be plainly marked on the side. This is necessary for the buyer's guidance, giving an indication of the size of the cabbages contained in the bag and saving unnecessary handling.

Cauliflower.

No difficulty should be experienced in marketing cauliflowers to the best advantage. The stalk is cut a short distance below the base of the leaf stalks. This short length of stalk gives protection and prevents the leaves from breaking away. All first quality cauliflowers for distant markets should have the sound leaves intact, and folded over the flower to prevent damage in transit.

Clean chaff bags, being light and airy, are the best containers. Corn sacks are often unsuitable, because of previous use for other produce. When bagged, cauliflowers should be packed with the leaves brought together to protect the head. This prevents bruising and discolouration, and keeps the heart white and attractive. The bottom layers in the bag should be placed with the stalk down, and the other cauliflowers placed with the stalks to the outside of the bag to prevent damage to the heads It is even more important to do this with cauliflowers than with cabbage. For a special trade, wrapping in cellophane or greaseproof paper (probably unobtainable in war time) and packing in crates has been found satisfactory, particularly when sending long distances. When packed in crates the side boards are spaced widely to display the contents. South Australian cauliflowers packed this way and conveyed to Cairns in the ship's cool chamber have opened up in excellent condition. In the United States cauliflowers are packed in crates of 16 and 20 heads.

First and second quality cauliflowers should be packed separately. Each bag should contain, as near as practicable, cauliflowers of the same size and quality. Mixed sizes do not sell as well as when the heads are graded. Any cauliflowers showing flower or leaf damage should be packed as second grade. Heads of first-grade cauliflowers should be firm and white and tight. Over-matured or fuzzy-headed specimens are best marketed separately. Stale, discoloured, or wilted heads should be kept separate from quality heads.

Markings should be placed on the bags before filling. Suitable stencils are easily procurable, and save time. The number in the bag should be conspicuously placed on the side of the bag. Packed bags should not be used as seats.

Cucumbers.

When sending the long green type of cucumber to far-away markets, the main essential is to avoid skin damage and so prevent "breakdown" after packing. Cucumbers should be picked while still young and green, and should not be allowed to yellow before removal from the plant. All malformed specimens should be kept out of first-grade consignments. The bushel case is the most satisfactory container to use, the cucumbers being placed across the case in layers or, if large-sized, lengthways. No particular system is used in packing the layers, the fruit being fitted as firmly as sizes permit. If a large quantity is available, it is best to sort them into at least three separate grade sizes, i.e., small,

Plate 37.

A CONSIGNMENT OF POOR QUALITY CUCUMBERS.—Note the comparison between the good cucumber in the centre of the picture and the poor pinched ended ones in the cases. This type of produce should never be sent to market.

medium, and large. When packed, the fruit should come slightly above the top of the case, being eased into position by gently bumping the end of the case on a piece of 3 x 2 timber. This keeps the bottom of the case off the floor and prevents damage to the bottom layer. To pack the apple type of cucumber, the same system of diagonal packing as that used for oranges should be applied, using the half-bushel case as the best container. In hot weather, cucumbers should be kept as cool as possible during all operations, and should not be cased unless pre-cooled.

Much trouble is experienced on interstate markets with cased cucumbers through the pulling out of nails, causing lids and bottoms to spring. Long nails should be used and driven home on an angle.

Peas.

The method of harvesting and marketing beans applies also to peas. The sugar bag type of container is mostly used. Some interstate suppliers use a bushel and two-bushel bag, which is popular on southern markets.

Peas should be picked and graded in the cool of the day, and pickings from old and young plants should be kept separate. Insect-affected and otherwise damaged peas should be rigorously rejected. Half-grown, unfilled pods should be left on the plants to fill out. Misshapen and poorly-coloured peas should not be mixed with the first grade. Keeping old and new pickings separate will achieve these results with the minimum of labour. Buyers easily detect the inclusion of old with young peas, and inevitably offer a lower price.

Sweet Potato.

There are two channels of disposal for sweet potatoes—the fresh fruit and vegetable market and the produce market. Growers supplying the fruit and vegetable market are advised to pack in sugar bags, which contain a quantity suitable for most buyers on that market. When sending through the produce market corn sacks are preferable, as on this market larger bulk purchases are usually made.

After digging, the potatoes should be cleaned before bagging. If large quantities are available, they should be sized into three classes and bagged accordingly. The weight of contents should be branded on the side of each bag. Bags should be well filled so that when the top is sewn it is still open enough to permit ready inspection. Top layers should be finished off by placing the potatoes the opposite way to which the sewing thread is stitched, thus making it possible for the sewing cord to hold the top layers securely in position. This method of bagging applies to all long-root vegetables.

Carrot.

The open mesh type is the best bag for packing carrots. With cornsacks, sweating may occur during long distance transport. Only sound carrots, free from skin damage and blemish, should be packed. Single-root types are classed as the highest quality, multi-root types as of lower grade, and split carrots as the lowest grade. Multi-root types should not be bagged with first-quality carrots. A small quantity placed with first-grade carrots will reduce the value of the whole consignment. All carrots for bagging should be topped closely, leaving not more than half an inch of green. When too much top is left on, buyers allow for

this as extra weight and reduce their price accordingly. Too much top may also provide conditions for the development of rot, which quickly reduces the attractiveness of bagged carrots. Carrots should be handled carefully, and should not be washed; washing reduces their storage life. Many consignments of washed carrots examined in Sydney have shown an early development of mould, rendering them unsaleable. Carrots should be sized into three classes—large, medium, and small. Very small carrots ("tiddlers") should in no circumstances be mixed with any grade, as they are almost always rejected by buyers.

For bunch marketing of carrots, the practice has been to wash the roots. Bunches of twelve or six are suitable. The same grade standards as for bagged carrots should be observed. Quality bunches should have all misshapen, diseased, split, or damaged specimens excluded, and bunched for sale as a grade, if worthwhile. Freshness of appearance is very important with bunched vegetables. Seedy carrots should not be marketed with younger roots, as buyers will adjust their offers accordingly.

Plate 38.

SALESMEN TRIMMING AND CLEANING UNSALEABLE CARROTS.—This line had been washed and incorrectly topped and had to be reconditioned and sold at a reduced price.

Beetroot.

In Queensland, beetroot is supplied almost solely to local markets. The practice has been to sell beetroot in the bunch. The same careful treatment as for carrots is advised. Presenting the vegetable with the top looking as fresh as possible is of especial importance. This point in vegetable marketing cannot be stressed too often, for, obviously, the retailer must have fresh-looking vegetables which will appeal to customers.

If beetroot is handled in bulk, bags are used. As with carrots, too much top should not be retained. Tops should be cut, not torn. Skin damage should be carefully avoided.

White Turnip.

Turnips are usually sold by the bunch. Buyers prefer the purple-topped, globe-shaped variety. Marketing methods are the same as with carrots. Bags are sometimes used, the sugar bag type being preferred by the local trade. Careful cultivation immediately before harvesting will prevent the roots from becoming soft and spongy through lack of moisture.

Pumpkins.

For the local market, pumpkins are loose in bulk. Interstate consignments are bagged. Pumpkins should be bagged just before despatch; if bagged for days or weeks beforehand, it will be necessary to empty them out and re-bag before consignment. A convenient weight is 1 cwt. to the bag. Grading for southern markets is necessary, and all immature, overripe, sunburnt, bleached, frosted, insect-damaged, and skin-blemished pumpkins should be rejected. Pumpkins should be cut, not broken, from the vine. Grading into sizes and for quality is essential. Pumpkins are only worth the value of the poorest specimens in the consignment. In no circumstances should faulty pumpkins be mixed with good pumpkins, even during periods of high prices. Because of their weight, it is doubly necessary to place the distinguishing marks or brands on both sides of the bags to avoid extra handling and quick delivery.

Plate 39.

A Poorly Selected and Badly Handled Line of Pumpkins.—A more careful selection by the grower would have avoided what was almost a total loss.

Marrows.

On the local market, marrows are either marketed loose in bulk, or in bags; but for long distance transport cases are used, as they are much more susceptible to injury than pumpkins. The tropical fruit case—24¾ inches by 12 inches by 12 inches internal dimensions—is the most suitable container. Packing is the same as with cucumbers; the selection and fitting in of the marrows being left to the commonsense of the packer. Small marrows should be excluded from all consignments.

Summary.

In concluding these hints, the following points are again stressed as fundamentals of successful marketing of fresh vegetables:—

Vegetables should be handled carefully, and should be fresh in appearance at all times.

Freedom from disease is essential.

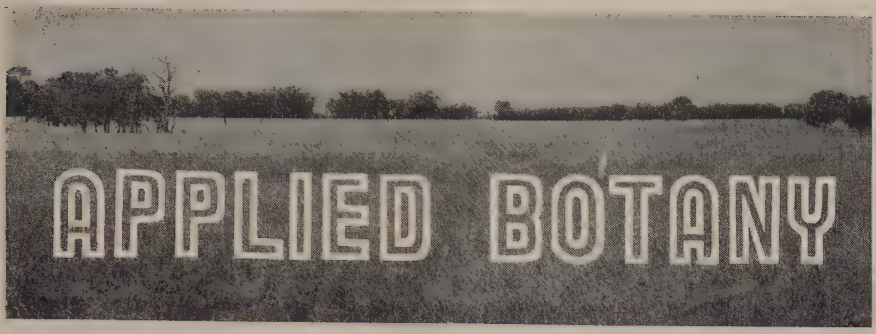
Grading for quality—damaged vegetables should never be sent to distant markets.

Low-grade vegetables should only be marketed when the price is payable, and always as second or third grade. Unsaleable rubbish becomes a carry-over and soon accumulates on market sections, causing sharp price drops.

Over-marketing of inferior grades is usually the cause of low prices, NOT over-supply of quality produce.

Plate 40.

PROLIFIC CROP OF CATTLE PUMPKINS ON CONDAMINE PLAINS.



Queensland Trees.

THE TALLOW-WOOD.

THE Tallow-wood* is a very large tree with reddish-brown, fibrous bark. In the more open forest, and on poorer soils it is frequently still a large tree, with the trunk usually very gnarled and branching from near the base. The outermost bark is shed in very small flakes or patches. The inner bark is fibrous and light brown. The stump shoots often have a purplish tinge, and the leaves are comparatively thin in texture, and rather shorter and broader than in most eucalypts. The ordinary leaves are also comparatively thin in texture in comparison with most other eucalypts. The flower-buds are club shaped. The seed capsule is narrow, about $\frac{1}{2}$ inch long and about $\frac{1}{4}$ inch in diameter. Its range is from Fraser Island, Wide Bay, in Southern Queensland, to a little south of Newcastle, New South Wales. The yellowish, somewhat greasy timber has an excellent quality for all purposes exposed to weather, particularly for sleepers, verandah posts, and flooring. The Queensland Sub-Department of Forestry recommend the timber as especially suited for dancing and skating floors, the greasy wood wearing evenly with a smooth and slippery surface. It does not rust ironwork. In seasoning the wood does not warp or crack to any extent, although it shrinks perceptibly. The only disadvantages are that paint and varnish are long in drying when applied to it, and as a pole timber it is inclined to split somewhat freely when exposed to the sun, and consequently has to be bound with iron. It lasts, however, a very long time in the ground.

* Eucalyptus microcorys.

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Plate 41.
A HANDSOME TALLOW-WOOD GROWING AT ASHGROVE, NEAR BRISBANE.

Plate 42.
FLOWERING AND FRUITING TWIGS OF THE TALLOW-WOOD.—The leaves in the left hand corner are from a stump shoot.

"Lion's Tail"—A Possible Serious Weed Pest.

C. T. WHITE, Government Botanist.

SPECIMENS of "Lion's Tail,"* a weed new to Queensland and which may become a serious pest in pastures, especially along rivers in Central and North Queensland, have been received recently for identification. The subjoined illustration and description will enable pastoralists to recognise it should it make its appearance on a property.

Description.

The plant attains a height of 6-8 feet; the stems and branchlets are markedly four-angled. The leaves are opposite one another, have bluntly toothed edges, and are 2-5 inches long. The chief characters of the plant are the burr-like clusters of flowers borne at intervals along the branches. The flowers are orange-red and when in full bloom the plant is highly ornamental. The objectionable nature of the plant is due mainly to the very spiny calyx, which consists of a green tube 1 inch long at the base of the flower and ending in eight sharply pointed teeth, the upper one much larger than the others.

Properties.

Little is known of the plant, although it is widely spread over the tropics of the world. Cook and Collins, in their *Economic Plants of Porto Rico*, say that at Arecibo (West Indies) the plant is regarded as poisonous. A correspondent, Mr. H J. Tyack Bake, says that the plant has become firmly established in parts of the Northern Territory, forming thickets through which it is almost impossible to penetrate. An allied species† is moderately common in garden culture in Queensland. It is a native of South Africa, more showy than the species here illustrated, lacks the objectionable spiny flower and seed clusters, and shows no indication of becoming a pest in any way.

* *Leonotis nepetaefolia.*

† *Leonotis leonurus.*

Plate 43.

Lion's Tail.—A possible serious weed pest.

(*Reproduced from the "Economic Plants of Porto Rico" by O. F. Cook and G. N. Collins. Contribution from the United States National Herbarium, Vol. 8.*)

PLANT PROTECTION

Citrus Aphids.

J. HAROLD SMITH, Senior Research Officer.

DURING the spring and early summer months, aphids are frequently troublesome in citrus trees in all parts of Queensland. Three distinct species have been recorded on oranges, mandarins, lemons, and grape fruit, but being similar in habits and much alike in appearance, they present, for all practical purposes, a single control problem. They are small, black or greenish-black, soft-bodied insects, which occur in dense colonies on the young shoots (Plate 44). In such colonies there may be winged adults, wingless adults, and the smaller immature stages, none of which exceeds one-tenth of an inch in length. All are equipped with highly specialised mouth parts, by means of which they pierce the leaf or shoot and extract the plant sap. Part of the sap escapes from the injured tissues and mixes with secretions of the insects themselves to produce a sticky fluid on which dark-coloured moulds develop and more or less cover the infested parts of the plant. Ants, especially species which feed on sugary substances, are attracted to the trees.

Nature of the Damage.

The immature, partly-opened leaves of infested shoots soon show signs of crinkling and later appear scorched. There may also be a certain amount of die-back at the tips. If the attack is severe and prolonged, subsidiary buds may develop and give a bunched appearance to the young growth, though such a malformation is considerably less acute than that produced by the citrus bud mite. As the infestation may persist from the first appearance of young growth in spring until the fruit is set, the pest has a twofold significance—plant growth is checked and fruit setting may be interfered with, particularly in a dry season, when the trees are suffering from stress conditions.

Control.

Aphids on citrus trees have many natural enemies, chief among which are the small, yellow, black-spotted ladybird beetles and the sluggish, grub-like larvae of hover flies. Though these predators destroy large numbers of the pest, injurious symptoms are frequently apparent before sufficient of them are present to appreciably reduce aphid populations. It is therefore unwise to depend on these and other natural enemies to keep the aphids in check.

Nicotine is the insecticide used in controlling citrus aphids and it is applied in a dust or a spray. Spot treatment of any trees on which colonies are seen early in the season will often suppress an outbreak

before it assumes any great importance, and should be a routine practice in all orchards where the pest is liable to occur every year. If this fails to give control, or if the pest is not seen until it is widely distributed through, and numerous in, the orchard, all trees must be sprayed or dusted twice with an interval of seven to ten days between the two treatments. As the insects are almost entirely restricted to the new growth on the outer fringe of the trees a drenching spray applied from the outside is quite adequate, provided cultural operations include the removal of water shoots on the main limbs. These water shoots are of no value, and are particularly attractive to citrus aphids. There is normally no need to operate the boom from the inside of the tree, as is done when sprays are applied for the control of most pests and diseases of citrus.

Plate 44.
CITRUS SHOOT INFESTED WITH APHIDS.

A nicotine spray can be prepared on the orchard to the following formula:—Nicotine sulphate, ½ pint; soft soap, 2 lb.; water, 50 gallons. The soap is first dissolved in about two gallons of warm water and the solution added to the other 48 gallons in the spray vat. Just before spraying is to begin, the nicotine sulphate is poured into the vat while the agitators are working. Power spray equipment gives the most satisfactory results, but a knapsack pump is reasonably effective for spraying a few trees which are small enough to be given an adequate cover without any great difficulty. Careful treatment is, however, essential for a few survivors from the double spray can soon produce pest populations again if weather conditions are suitable for the insect.

Dusts used as an alternative to sprays must have a nicotine content of at least 3 per cent. Properly mixed dusts of the prescribed quality are sold by most dealers in insecticides, and should, of course, be applied to the trees with a rotary or comparably efficient dust gun capable of distributing the insecticide over the trees.

Downy Mildew and Powdery Mildew of the Cucumber.

F. W. BLACKFORD, Assistant Research Officer.

THE two most destructive diseases with which cucumber growers have to contend are downy mildew and powdery mildew. These two mildews are usually to be found in every cucumber crop in Queensland, the former being the more destructive of the two; they nearly always occur together, and such dual infection frequently results in heavy losses.

The first symptoms of downy mildew are the light-yellowish to yellowish-brown spots which develop on the older leaves of the vines. When high humidity prevails, the under side of these spots is covered with a light-mauve coloured down, which is the spore-bearing portion of the fungus causing the disease. The spots enlarge, turn brown, and ultimately dry out, thus giving the leaf a scorched appearance. The dried-out tissue tends to break away, and very often only the main veins with a ragged edge of attached leaf-tissue are left; the leaf frequently curls up and becomes claw-like in appearance. The disease progresses from the centre of the plant outwards, so that, on severely affected plants, all that remains of a runner may be the few green leaves at the tip. The cucumber fruit is thus exposed to the sun, and severe sunburning often occurs.

Plate 45.
SEEDLING CUCUMBER LEAF SHOWING PATCHES OF POWDERY MILDEW.

Because the fungus which causes powdery mildew is so readily observed, this disease is often blamed for the loss due to downy mildew, whereas usually it is merely intensifying the injury caused by the latter. The white, floury patches of the fungus causing powdery mildew (Plate 45) are found on both sides of the leaves and on the stems, and are very distinct. At first these patches are not much larger than a threepenny piece, but later they may enlarge to cover the whole of the leaf with a greyish-white powdering of spores. As is the case with downy mildew, the oldest leaves in the centre of the plant are attacked first; they turn from green to yellow, then to brown, and finally dry out and crumble away, thus exposing the fruit to sunburning.

Control.

The infection of a cucumber crop by downy mildew may be prevented by the application of copper sprays or dusts. As Bordeaux mixture has been recorded as exerting an adverse effect on the growth of cucumbers, growers who intend to spray are advised to use home-made cuprous oxide mixture, at a strength of 3 gallons of the stock solution to 40 gallons of water, or to use one of its commercial equivalents. Spraying or dusting should commence shortly after the plants are above ground, and applications should be made as often as is necessary to keep new growth covered. Both surfaces of the leaves should be sprayed or dusted as thoroughly as possible.

The development of powdery mildew infection may be checked by dusting with a mixture of equal parts of dusting sulphur and hydrated lime or by using one of the commercial sulphur sprays marketed in Queensland as wettable or colloidal sulphur. This disease differs from downy mildew in that the sulphur dust or spray will actually kill the fungus after it makes its appearance. Hence sulphur applications may be delayed until the floury patches are noticed on the leaves, whereas the copper spray or dust, used for the control of downy mildew, must be applied before the disease appears.

As mentioned previously, the two diseases generally occur together, and consideration should therefore be given to the question of spraying or dusting with a combination mixture. The copper sprays or dusts used to prevent downy mildew will serve to delay the appearance of powdery mildew, but nevertheless it may be necessary to occasionally also apply sulphur for the control of the latter disease. If sprays are being used, this can be accomplished by applying a combination mixture of one of the wettable or colloidal sulphurs referred to earlier and either home-made cuprous oxide or one of its commercial equivalents. If dusts are preferred, dual purpose dusts containing both sulphur and copper may be used; these can be purchased from commercial firms selling spraying or dusting materials. The sulphur included in these combinations, in addition to dealing with powdery mildew, will also serve as a control for any red spider infestation which may be present.

If the grower is purchasing a dust, consideration might be given to a mixture containing copper, sulphur, and lead arsenate; such a dust would control downy mildew, powdery mildew, red spider, and any leaf-eating insects which might be present on the cucumber vines. If he is using a spray and leaf-eating insects appear, the position can be met by adding lead arsenate to the spray. There is a possibility that undesirable quantities of lead arsenate residue may accumulate on the skin of the fruit if this insecticide is incorporated in a spray or dust applied late in the development of the crop; there is, of course, a safeguard to the consumer in the fact that the skin is removed before the fruit is eaten. Nevertheless, it is desirable to concentrate on the control of leaf-eating insects at an early stage in the growth of the crop. By doing so, the necessity for arsenical applications during the later stages of its development may be eliminated.

Fruit Fly Luring Investigations.

N. E. H. CALDWELL, Assistant Research Officer and
A. W. S. MAY, Assistant Research Officer.

DURING recent years, investigations on the control of fruit flies in Queensland have been mainly concerned with the development of improved lures. The original objective of the work was to determine what components of certain complex mixtures are attractive to fruit flies and then to build up more efficient formulae. It was soon found, however, that marked improvements on existing lures could be made rather rapidly by simple, empirical methods. The following account deals largely with results obtained by these methods.

Location of the Work.

Most of the field experiments have been conducted in the citrus orchards of the Maroochy district with Nambour as the centre. Some work was also carried out in citrus at Gayndah and in deciduous fruits at Toowoomba and Stanthorpe. The citrus areas proved by far the most satisfactory for experimental purposes, as large numbers of flies are almost invariably present in the orchards during spring and autumn. In deciduous orchards, on the other hand, the fruit fly populations vary a great deal from season to season, and much time may be lost on experiments which prove abortive because flies fail to appear in sufficient numbers to give significant results.

Confirmatory experiments with promising lures were carried out in districts other than Maroochy and, so far, the best lures have given satisfactory results wherever they have been tested.

Methods Employed.

All experimental work has been carried out under orchard conditions. A common type of screw-top glass fly trap, without legs, has been used throughout the investigation.

After preliminary work of an exploratory nature in 1939, a standard form of experimental design was adopted for the so-called elimination trials, i.e., trials to decide if new formulae deserved detailed investigation. This design, a randomised block, permitted a comparison of six lures, each lure being replicated four times. Of these six lures, two, the efficiency of which is well known, were adopted as standards. These were included in each experiment so that results from all such experiments could be compared with some degree of accuracy.

One trap, regarded as a unit plot, was hung in either adjacent or alternate trees in any one experiment, the choice depending on the number of trees available. Traps were hung in similar positions in any one season's experiments, the position in each tree being fixed at the beginning of an experiment. Errors due to positional effects were, to some extent, avoided by rotating the traps in a pre-determined direction at regular intervals, either one or two days, so that at the end of the experiment each trap had spent an equal period in each tree used in any one replication of the six lures being tested.

The early experiments lasted for only six days, the traps being changed from tree to tree every day. Later each experiment extended

over twelve days, and the traps were moved at two-day intervals. In the latter case, the traps were recharged with fresh lure at the end of the first six days, unless information on the period for which lures remained attractive was required. The six-day period was primarily determined by the type of experimental design, but it was soon found that, under ordinary field conditions, the traps needed refilling at about this interval.

Other experimental designs, involving the simultaneous comparison of a larger number of lures, have also been used. These designs were of value in determining the optimum proportions of ingredients in lures and in making final comparisons of a number of the more efficient lures.

Flies were counted and the sexes recorded either at intervals during the experiment—usually on the days when the traps were changed from tree to tree—or at each recharging of the traps. All the data obtained were examined statistically.

In all districts, and particularly in the coastal areas, many species of fruit flies enter the traps, though a few well-known species make up most of the catch. Little is known of the habits and importance of the remainder, some of which are apparently unnamed. The fruit flies caught have been identified whenever possible, in order to determine the proportion of pest species in the total catch. When the large number of fruit flies caught made positive identification of each specimen impracticable, a fairly accurate picture of the numerical abundance of each species was obtained by sampling methods.

Using these methods, nearly 300 lures were tested between 1939 and 1941, when the investigation was temporarily suspended.

Type of Lures Tested.

The materials used in experimental work may be roughly classified as follows:—

A. Alkalies, e.g., ammonium carbonate, caustic soda.

B. Complex organic substances, e.g., orris root, cotton-seed meal, maize meal, flour, pollard, bran, fruit rind, meat extract, preserved yeast, molasses, honey, natural vanilla essence, aniseed oil.

C. Simple organic substances, e.g., carbohydrates—arrowroot starch, sugar; proteins—gelatin; aromatics—ionone, vanillin, coumarin.

D. Preservatives, e.g., corrosive sublimate, borax.

E. Yeast cultures.

The attractiveness of ammonia in very weak concentration to some species of fruit flies is illustrated by the ammonia-vanilla lure used in controlling the Queensland fruit fly for a considerable number of years. Examination of another lure formula suggested that the addition of other substances to ammonia considerably enhanced its attractiveness, and it was soon found that mixtures of ammonia with pollard, bran, or orris root caught a larger number of fruit flies than the ammonia-vanilla solution. In fact, it appeared that vanilla was unnecessary and might even be detrimental to lures in which ammonia was an essential constituent. As soon as the value of such mixtures was

realised, considerable attention was given to the development of lures which might serve as interim recommendations for fruit growers. Some of these are given below, but other very promising formulae are omitted as some of the ingredients are not now readily available.

A few lures and baits used in other countries against fruit flies have been tested. Some of these caught a considerable number of the Queensland species, but all are inferior to the lures now recommended for trial by the growers.

Lure Recommendations.

Lure 1.—Cloudy ammonia, 1 teaspoonful; pollard, 2 level teaspoonfuls; rain water, 1 pint.

This lure catches fruit flies in large numbers, being apparently more efficient in spring than in autumn in citrus districts. It has the disadvantage of catching considerable numbers of blowflies, which tend to foul the trap after a few days. Although some of the lures mentioned below also possess this fault they attract more fruit flies and, accordingly, are now recommended in preference to Lure 1.

Lure 2.—Pollard, 5 level teaspoonfuls; ammonium carbonate (chemically pure), 1 level teaspoonful; tank water, 3 pints.

This lure is more efficient than Lure 1, but is not equal to Lure 4. It also catches large numbers of other insects.

Lure 3.—Maize meal, 5 level teaspoonfuls; ammonium carbonate (chemically pure), 1 level teaspoonful; tank water, 3½ pints.

This lure shows promise of being superior to the pollard mixtures (Lures 1 and 2). Few insects other than fruit flies are attracted to it, and the fouling of traps is, therefore, of little importance.

Lure 4.—"Dribarm" preserved yeast compound, 3 level teaspoonfuls; ammonium carbonate (chemically pure), 1 level teaspoonful; tank water, 3½ pints.

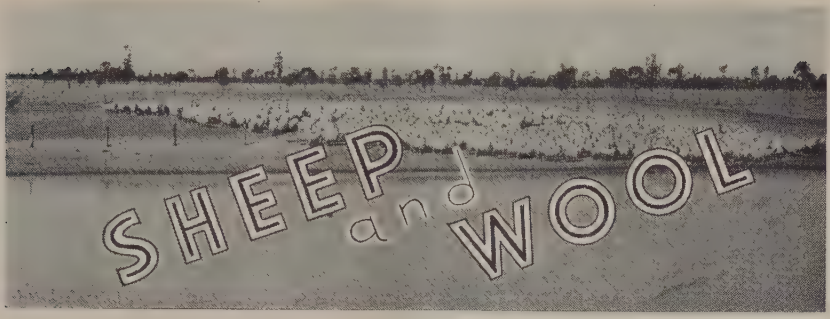
This lure has seldom been surpassed in the number of fruit flies caught. However, it also catches large numbers of insects other than fruit flies. Traps quickly become fouled and should be thoroughly cleaned before recharging.

Lure 5.—Rind and rag of one ripe or ripening orange, about 2½ inches diameter; concentrated (18 per cent.) aqueous ammonia, 6 teaspoonfuls; tank water, ¼ pint.

Shred the orange rind finely with a sharp knife. Add the ammonia and water and keep in a tightly-corked container for 24 hours. To make up the lure ready for the traps, take 2 tablespoonfuls (8 teaspoonfuls) of the liquid and add to 3½ pints of tank water.

Lure 5 is one of the most promising so far developed. Its attraction for fruit flies appears to be at least as good as that of the maize meal or pollard lures, and it catches practically no insects other than fruit flies.

In experimental work with these lures the traps were recharged with fresh material every six days. Until more is known of their performance this interval should not be exceeded. On the other hand, under conditions of high evaporation and large catches it may be necessary to recharge the traps at shorter intervals.



The Corriedale.

J. L. HODGE, Instructor in Sheep and Wool.

THERE is a bright future for the Corriedale in Queensland. Judged from any point of view this breed has, as in other States, come to stay. The Corriedale proper was evolved about 65 years ago by crossing the Lincoln with the Merino. The breed is now regarded as pure bred. A breed is said to be pure when it will reproduce its type with certainty. The Corriedale will become more general in Queensland than as a farmer's dual-purpose sheep, and the time is fast approaching when this breed will be run extensively on marginal areas of the Darling Downs, and especially on much of the rich brigalow and belah country reclaimed from the prickly pear infestation.

There is a tendency with some Queensland sheep men to breed the Corriedale too fine. This is a mistake and to some extent nullifies the reasons for which the breed was evolved. Loss of size and constitution follow too fine a fleece.

The covering of the Corriedale should be strong—somewhere about 54s 56s quality—and with strength should go length. A strong, short wool is common and not to be desired. The fleece should be bright. Scientific culling in a Corriedale flock should proceed from both ends, as it were. Anything tending to too much Lincoln is undesirable, and anything showing too much of the Merino type should be rejected. Conformation and size, too, have great weight with this fast-improving breed.

As in other Australian States, there is no breed of sheep so fast increasing in general favour. With the increasing importance of the fat-lamb industry in Queensland Corriedale flocks will assuredly increase in number.

Queensland lands generally suit the Corriedale remarkably well, and on rich scrub lands individual animals attain a great size.

Of the utmost importance to improvement and maintenance of the standard to which this valuable breed of sheep has attained is the matter of culling, which should be rigorous. Because a strong fleece is desired, as compared with the Merino, is no reason why a rough fleece should be accepted. Quality and character are just as easily attained in a strong as in a fine wool.

In the fat lamb industry, it is confidently anticipated that even greater use will yet be made of the Corriedale. The breed is easily domesticated—a very important point in farmers' flocks—and the ewes

are excellent milkers. This characteristic combined with feeding on cultivated crops ensures the early maturity which is so desirable in the fat lamb industry.

There is, too, a constantly increasing demand on the world's market for Corriedale wool properly bred. In fact, the prices obtained for Corriedale wool compare more than favourably with some merino clips. Other points in favour of the breed are the weight of wool cut per head, and the fact that these sheep are less susceptible to fly strike.

CROSSBRED EWES FOR FAT LAMBS.

As 98 per cent. of the sheep population of Queensland consists of merinos, farmers are obviously at some disadvantage in respect of the availability of the right type of ewe for the breeding of early-maturing spring lambs. Farmers who are using long-wool rams—such as the Romney Marsh, Border Leicester, or Lincoln—are, therefore, strongly advised, in their own interests, to retain at least some of the ewe drop as their future breeders.

From a purely monetary point of view such a practice would undoubtedly pay. While the cry is always that crossbred ewes of the right type are either too expensive or unprocurable, year in and year out, ewe lambs are slaughtered in Queensland which, if kept for breeding, would have a most beneficial effect on the production of fat lambs. Farmers not in a position to hold all the ewe drop from the long-wools should, at least, retain some proportion each year with the idea of eventually working into a crossbred flock.

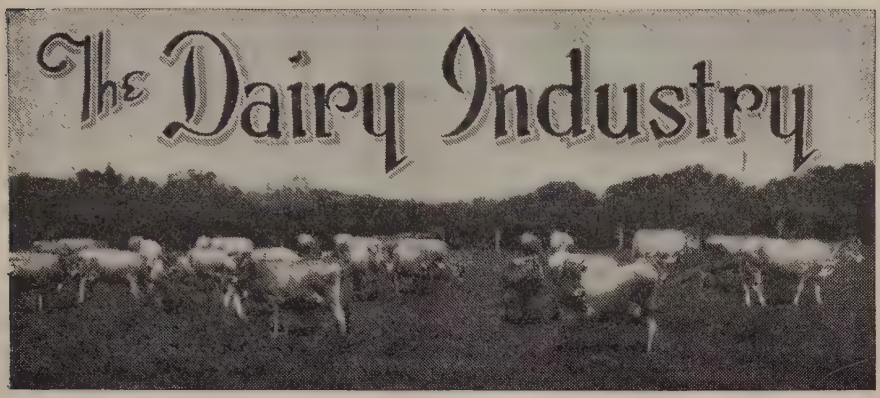
—J. L. HODGE.

TRUCKING FAT LAMBS.

Bruising of lambs on the way to market is not uncommon, but to a great extent the remedy is in the hands of growers.

The tenderness of sucker lambs is often not appreciated, and they are handled frequently like fat sheep. Sheep, too, may be bruised by bad handling, though not so badly as sucker lambs. It should be remembered that true sucker lambs have never been off the mothers. It is advised, therefore, that if a road journey has to be undertaken some of the ewes should accompany the lambs to the trucking yards. Untrained dogs should not be used for yarding the lambs. A lamb should never be lifted by the skin. Prodding sticks should never be used. Over-crowding in the trucks should be avoided entirely. In all cases, every endeavour should be made to deliver the lambs at the market with the bloom on them. A certain loss in weight and appearance is unavoidable on a long journey, but if the foregoing rules were observed strictly complaints of bruising would be rare.

—J. L. HODGE.



Farm Made Butter—Churning Difficulties.

O. St. J. KENT, Senior Dairy Technologist.

MANY requests have been received from farmers and house cow owners for advice about cream which they have not been able to churn into butter At this time of the year, difficulties in churning are likely to occur, especially with cream from a few house cows or a single herd. There are several reasons why, on occasions, the churning process takes a long time or fails completely in home butter making, viz.:—

(*a*) Dry winter feed.
(*b*) Cows in advanced lactation.
(*c*) Thinness of the cream.
(*d*) Lack of proper ripening of cream.
(*e*) Overloading the churn.
(*f*) Cream too cold.

Dry Winter Feed.

During cold weather butter-fat is usually much harder than it is in summer. This is due to the feed of the cows. In winter the feeds are dry and hard compared with the abundant luscious, green, softer food of the summer. When fat is soft, it is easy for the fat globules to be brought together to form butter in the churn, but when the fat is hard it is much more difficult. It is realised that it is not always possible or easy to change the diet of a cow, but where one is able so to do, the feeding of some succulent feeds such as silage, roots, or concentrates rich in vegetable oils such as linseed meal will produce softer fats and consequently easier churning. However, a cow should not be suddenly changed from one food to another.

Cows in Advanced Lactation.

Milk from cows well advanced in lactation differs in a number of ways from milk in the earlier part of the lactation period. In the first place, late lactation milk contains fat globules which are much smaller in size than normal milk. The presence of these very small fat globules makes it difficult to churn cream from such milk into butter, because the small globules are capable of resisting the force of concussion exerted during the churning process. Also, cream from late lactation milk is more viscous or sticky than ordinary cream and,

consequently, is more resistant to the churning process. The viscosity or stickiness of the cream is associated with the higher protein content found towards the end of the lactation period The addition of small amounts of dry salt to the cream will reduce the viscosity and improve the churning qualities of the cream. At times the addition of small amounts of hot water to the cream has been found of benefit with stubborn cream. In the case of cream from a herd of cows, it may be advisable to dry off those cows which are most advanced, or to exclude their milk from that used for separation.

Thinness of the Cream.

Sometimes, cream is separated with a test of 25 per cent. or less. Thin cream such as this is more difficult to churn than richer cream, because the proportion of serum to fat is greater. Churning depends on agitation or concussion of the fat globules, and if the fat particles are separated by large volumes of serum, the chances of their being brought together to form butter granules are considerably lessened. It is a good plan, therefore, to make sure that the separator is giving a cream of reasonable richness—e.g., a test of 36 per cent. fat.

Lack of Proper Ripening of Cream.

For farm made butter, it is desirable to develop a certain amount of acidity or sourness in the cream. In other words, the cream should be allowed to ripen. Very fresh cream is more difficult to churn than older cream. The ripening process has the effect of reducing the viscosity of the cream and thus enables the process to proceed normally. Cream will usually ripen satisfactorily if kept at a moderately cool temperature of 70 degrees to 75 degrees F. for twenty-four to forty-eight hours. The safest way to control the ripening process is to add to the cream a culture of lactic acid bacteria or "starter," which may be obtained from the Department of Agriculture and Stock or from a neighbouring cheese factory.

Overloading the Churn.

A churn which is filled with too much cream will generally give trouble. Do not fill the churn more than one-third to one-half full with cream. This will give the cream more room to move, and hence the churning will be more effective. "More haste, less speed," is a maxim that will be brought home to one who tries overloading the churn.

Cream Too Cold.

Cream that is too cold is hard to churn. Temperatures between 60 degrees to 70 degrees F. are satisfactory for churning, but the more the temperature drops below 50 degrees Fahrenheit the more difficult will it be to make butter. In very cold weather, therefore, if the temperature of the cream falls too low, something should be done to warm the cream, either by adding small amounts of hot water to it or in some other convenient way.

Improving Churning of Stubborn Cream

Here are a few suggestions for improving the churning properties of stubborn cream:—

(1) Add some dry salt to the cream.
(2) Add small quantities of hot water to the cream.
(3) If possible give cows some succulent feeds.

(4) Ripen the cream; if it will not sour normally, obtain a lactic starter from the Department of Agriculture and Stock or from a neighbouring cheese factory.
(5) Separate the cream so that it is reasonably rich. A test of 36 per cent. is a good average one.
(6) Do not overload the churn.
(7) Do not churn cream at too cold a temperature.

Selecting the Dairy Heifer.

E. B. RICE, Dairy Branch.

CAREFUL breeding and selection, with due appreciation of production and conformation, is the keynote to success in dairy herd improvement.

Having regard to the cost of rearing a heifer until it becomes profitable, the necessity for careful and skilful selection is evident. Naturally, it is expected that any animal chosen for retention in, or as an addition to, a herd will grow into a mature cow of good constitution with a reasonable probability or her production being higher than, but at least equal to, the herd average.

In appraising conformation and type, the immaturity of the young animal should be given due consideration, but it should possess essentially the desirable characteristics sought for in mature stock. Briefly, the chief external characteristics used as a guidance in choosing a dairy heifer are:—

(*a*) It should possess good dairy form, especially evidence of feeding capacity, blood circulation, and mammary development
(*b*) It should be a healthy, growthy individual.
(*c*) It should be stylish and of good general appearance.

In utilising production records as a basis of selection, the farmer will have to exercise his own judgment, according to the herd standard, as to the milk or butter-fat yield required before the progeny of any cows will be retained and reared for herd replacements. The standard will be raised in succeeding years as the herd level rises. The retention in the herd of heifers from cows whose production is not less than 500 gallons of milk, or 200 lb. of butter-fat per lactation, should be the aim in an efficiently managed herd.

Pure Bred Stock

In the selection of a pure-bred heifer or calf, dairy type or conformation, coupled with pedigree, gives definite guidance. Good conformation will ensure that the heifer, if inheriting productive qualities, will develop into a cow possessing a constitution capable of standing up to the strain of milk secretion over a long number of successive lactation periods. Any weakness in constitution should be interpreted as a warning sign. Although a heifer possessing superior dairy conformation is undoubtedly likely to prove a better producer than one showing defects apparent to the eye, conformation itself cannot be taken as a reliable guide to

productive ability; investigations have shown that the chance of selecting by external features alone the highest producer among a group of cows, all of good conformation, is only about one in five.

The mere possession of a pedigree denoting purity of breed is, too, not sufficient evidence of suitability for retention for herd replacement. It is now well recognised that not only should the pedigree show that the animal is pure-bred, but also that she is descended from families which by actual records of productive ability have proved themselves. In the examination of a heifer's pedigree, the production figures of her nearest female ancestors on both the dam's and sire's sides are first noted; records of full sisters and other relatives, if available, are likewise reliable indicators of production tendency.

Grade Stock.

In choosing a heifer from a grade herd, reliance should usually be placed on the ability to discern from external features alone an animal which promises to develop into a satisfactory producer. In grade herds, in which the advantages of the grade herd recording scheme have been availed of, selection may be more reliably undertaken by using as a basis not only type, but, in addition, the production records of the herd. Production testing and its intelligent application, by placing breeding and selection on a constructive basis, is a matter of major importance in the grading up of an ordinary dairy herd.

CARE OF MILK AND CREAM.

Milk when drawn from the cow is usually of good quality, unless it has a weed or feed taint, or the farm water supply is stagnant or otherwise below the standard of quality required. Tainted or bad milk or cream is a general cause of the low quality of cheese and butter, which is so often recorded. If the question were asked, "Who or what is mostly to blame for the low grade of some dairy produce, the cows, the farmers, the cheesemakers, or the buttermakers?" the answer should undoubtedly be, "First, the farmers, then the cheesemakers and the buttermakers, and, lastly, the cows." There is, generally, no reason why cheese and butter should not be of good quality if milk and cream are properly produced and treated. From the factory point of view, it is impossible to make high-grade cheese and butter out of low-grade milk and cream. And it has to be acknowledged that factory management and equipment have attained high standards in Queensland, and that factory personnel, holding certificates of competency, are highly skilled. Therefore, as a general rule, it is reasonable to look to the dairy for causes of defects in milk and its products.

Carelessness in handling milk or cream is not, as so often claimed, due to ignorance, for every dairy farmer knows or should know how to ensure cleanliness in his dairy. It is a reasonable conclusion, therefore, that defects in dairy produce do not develop because of lack of knowledge but because of lack of good will. Carelessness, slovenliness, bad and dirty habits and customs in and around dairy premises are the primary causes of low quality in dairy products. If one dairy farmer can supply first-grade milk or choice cream with unfailing regularity, another farmer, surely, can do likewise! The main essentials of successful dairying are wrapped up in the one word—*cleanliness.*

—L. VERNEY.

WHEY ON THE FARM.

Whey as a stock food has become of greater importance as a consequence of the expansion of cheese production. The *Dairy Produce Act* specifies that whey must be effectively pasteurised at a cheese factory before its return to farmers. While primarily intended as an anti-disease precaution, pasteurising improves the keeping quality of the whey, and by retarding acid development minimises the risk of digestive disturbances in pigs and calves.

Because of transport restrictions, milk cans are often used for bringing whey back to the farm, but, if practicable, other cans should be used exclusively for whey. If, however, whey must be returned in milk cans, it should be emptied from the cans immediately on arrival back on the farm, and the cans thoroughly washed and scalded or steamed and inverted on a metal draining rack to dry and air. Sour whey, if left in cans, will soon remove the tin coating and cause rapid rusting.

Careful attention to the following points will ensure that whey will be a safe and attractive stock food:—

Scrupulously cleanse in the same way as with all other dairy utensils any drums or other vessels used to hold whey on the farm.

Keep whey in a *cool* place.

Cover the top of the vessel with hessian or board to keep out flies.

Never put fresh whey in vessels containing stale whey, or vessels which are not completely clean.

A pamphlet entitled *Feeding Whey to Calves and Pigs* is issued free of cost by the Department of Agriculture and Stock, Brisbane.

—E. B. RICE.

DAIRY ENGINEERING.

A chemical engineering survey of Queensland butter factories is being conducted at present by a chemical engineer attached to the Dairy Research Laboratory. The immediate object of the survey is to stimulate all possible economy in the operation of dairying plants in this State. Experience has shown that refrigeration and fuels are the most likely directions in which worthwhile economies are often possible.

Following the survey of butter factories a similar programme is contemplated in regard to cheese and milk factories. All such saving as can reasonably be made under the present difficult conditions will obviously revert to a direct saving for the milk and cream producer.

It is hoped, eventually, to establish a complete engineering section in the Department sufficient to advise on all engineering matters in the dairying industry, and at the same time to undertake research work along lines promising improvement on present day operating technique.

Any assistance required by dairy farmers in connection with their own problems, such as cooling milk or cream on the farm, water supply, &c., will be gladly given on writing to or calling at the Department of Agriculture and Stock, Brisbane, or a country centre at which an officer of the Dairy Branch is stationed.

—F. G. FEW.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society, Jersey Cattle Society and the Ayrshire Cattle Society, production records for which were compiled during the month of July, 1943 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
Mature Cow (Standard 350 lb.)				
Fairvale Ethel	J. H. Anderson, Southbrook	11,185·38	453·374	Blackland's Stately Major
Senior, 4 Years (Standard 330 lb.)				
Alfa Vale Pansy	W. H. Thompson, Nanango	16,870·7	723·584	Reward of Fairfield
Junior, 3 Years (Standard 270 lb.)				
Penrhos Bonnie 10th	A. Sandilands, Wildash	6,275·82	281·783	Penrhos Pansy's Prince
Senior, 2 Years (Standard 250 lb.)				
Rosenthal Choice 17th	S. Mitchell, Warwick	7,600·21	313·933	Rosenthal Perfection
Mountain Camp Reflection's Rosette	W. Caldwell, Bell	5,742·21	254·341	Trevor Hill Reflection
Junior, 2 Years (Standard 230 lb.)				
Fairvale Minerva	J. H. Anderson, Southbrook	8,542·77	318·867	Fairvale Czar
Trevor Hill Jeanette 2nd	Geo. Gwynne, Umbiram	7,856·32	308·753	Rosenthal Musketeer
Glen Idol Daphne 7th	Estate, P. Doherty, Gympie	6,821·7	293·634	Blackland's Count
Glen Idol Primrose 6th	Estate, P. Doherty, Gympie	6,850·55	270·833	Blackland's Count
Trevor Hill Crystal 2nd	G. Gwynne, Umbiram	7,248·82	269·564	Rosenthal Musketeer
Burnland's Dolly 2nd	J. E. Burnett, Brookfield	6,815·99	254·531	Blackland's Red Prince
Trevor Hill Lila 2nd	G. Gwynne, Umbiram	6,569·78	249·582	Rosenthal Musketeer
Tabbagong Ruth 35th (217 days)	J. Crookey, Allora	6,334·29	242·33	Parkview Consul
Penrhos Merle 10th	A. Sandilands, Wildash	5,498·25	234·204	Penrhos Pansy's Prince
Penrhos Evelyn 8th	A. Sandilands, Wildash	5,581·43	230·944	Penrhos Pansy's Prince
Trevor Hill Blanch (253 days)	G. Gwynne, Umbiram	5,917·84	230·626	Rosenthal Musketeer

Economy and Palatability of Pig Foods.

E. J. SHELTON, Instructor in Pig Raising.

TO produce pigs economically, recourse should be had to the use of as great a variety in the diet as possible, and a variety of foodstuffs should, as far as can be arranged, be produced on the farm. While the cost of the pigs' ration has to be kept in mind, consideration should be given to its quality, continuity of supply, and the palatability of the various feeds.

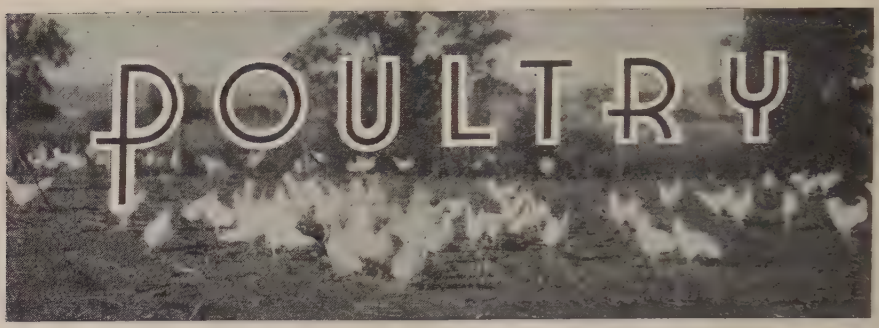
No foodstuff should be used, no matter how cheap or how palatable to the animals, if its use will detrimentally affect the quality of the resultant carcase. Peanuts, for instance, while most appetising and palatable to pigs of all ages, and productive of good growth averages, should quite definitely be omitted from all rations fed to pigs in preparation for market, otherwise the pork and bacon and other products will be unsaleable, being soft, oily, and carrying a very unpleasant (fishy) flavour. Even for small goods, oily pork is of no value, for, if used, excess of oil will ooze and drip and completely spoil their sale. Most people do not like fat meat, and they certainly will not appreciate soft and oily hams or bacon.

Again, what is suitable for one class of stock, or stock at a particular age, may not be suitable for all animals, and the methods of using stock food governs its relative value. For all producing animals, that is, animals which convert the food eaten into some direct product—progeny, milk, meat, wool, &c.—sufficiency of food is essential; therefore the ration should be appetising, nutritious, and easily digestible.

Unless the ration is palatable, the animals will not eat enough to make their feeding a profitable venture. Some bulky roughage, it is admitted, is necessary, and some foods somewhat unpalatable as a single item may be mixed with more palatable foodstuffs to build up a sound ration. Roughages should be fed with concentrates. In some systems of feeding, the addition of molasses is advised, although only in small quantities, for, if fed too liberally, scouring and digestive disorders may result. Molasses is purely a laxative fattening food containing no protein, but is nevertheless a very useful supplement.

Cost of Foods.

Purchased feeds for pigs should be economically priced; fortunately, it so happens that most of the food which the farmer may need to purchase is required in very small quantities, hence, per unit, may not be necessarily expensive. The subject requires careful study in order to avoid the production of animals at a rate that will not pay.



The Care of Growing Chickens.

P. RUMBALL, Poultry Expert.

THE age at which the chickens should be taken from the brooder depends largely on their growth, and the climatic conditions. Generally, the earlier chickens are taught to use the perch the better. In this position they obtain an air supply carrying the least fouling and do better. The first perches should be placed in the brooder house when the chickens are about 4 weeks old; this allows the chickens to use them throughout the day and makes weaning from the brooder easier.

With the colony brooder, it is easy to instal a light system of perching. The perches should only be about 6 inches above the level of the floor, with a ramp leading upwards. A good plan is to attach 1-inch-mesh netting under the perch and ramp. This will keep chickens off ground level, and allow ready movement from perch to perch. The netting should, however, be taut. If netting is unavailable, slats may be used, about an inch apart. In a few days time, the chickens will have become accustomed to the perches, and if development and weather are suitable, the brooder may be removed from the house. When this has been done, it is most important that those attending the chickens should be on hand at dusk to see that the chickens go on to the perches. They may have to be driven up and kept there until they have finally settled down for the night. There will be a crowding, but they will not use the perches only, most will be on the netting. Providing the crowding is not too close, no harm will follow as those underneath will still get air. This would not be so if they were crowding on the floor, and not upon netting, nor would the slats give the same protection. As the chickens grow older the perching arrangement may be gradually raised to the height of the ordinary hen roost. It is necessary to stress the need for attendance at dusk for some nights (three or four with light breeds and at least a week with heavy breeds) in order to make sure that the chickens do use the perch; in fact, on every occasion that an alteration is made in the system of perching, or when birds are removed from one house to another, it is necessary to make sure that the perches are used.

Segregating the Sexes.—The rearing of cockerels and pullets separately allows for different treatment, protects the pullets from bullying, provides more feeding space, and prevents crowding on the perches. Among the light breeds, segregation may be done at the early age of two or three weeks. The earlier it is done the better, if brooders or rearing houses are crowded. It should not be delayed any longer than

6 weeks. The male birds may easily be distinguished by the development of the comb and wattles, and the more rapid growth of wing and tail feathers. Those features may not be pronounced in slowly developing birds.

Development of the heavy breeds is much slower, and the males do not possess the domineering nature of those of the light breeds. It may be some months before the sex of all heavy breeds can be determined, but segregation should be practised as early as possible.

As the birds develop they require more room, air, feeding, and drinking space. This is provided to a considerable extent by segregation. For grown birds, at least one foot of feeding space should be allowed for each ten.

Grading.

The grading of both cockerels and pullets according to size is almost as important as segregation. The number reared in each clutch and the size of the buildings in which birds are being reared governs largely the feasibility of grading. Units of 100 are more satisfactory among layers, and the more rapidly the pullets can be reduced to this number the better. Although grading to size and development is suggested, the backward birds from one batch should not be placed with younger chickens. Grading of pullets will lead to uniformity of development, with fewer runts in the young flock. Where clean range is available it may be desirable to place the pullets in colony houses; otherwise it would be better to place them in the laying houses.

Feeding.

Pullets should be fed on a "growing" mash and grain, with shell or limestone and hard grit, charcoal, and water constantly available to them. If dry mash is fed, there should be ample feeding space—one foot for each ten birds is recommended. Feeding hoppers should be so constructed so that no food shall be wasted or fouled. When wet mash is fed to growing stock, it is advisable to give one full meal of mash early in the morning, and a smaller meal at mid-day. These meals should be fed at the same hours each day. In feeding grown birds, the general practice is to supply only the morning meal of mash. If this practice is adopted, it is essential that the mid-day meal of mash be discontinued before the pullets commence laying. Chaffed green feed or soaked lucerne chaff may be substituted at mid-day for the mash.

When "growing" mash is fed, it should be used until the pullets are about four months old, and then changed for "laying" mash. Should the change be delayed until the pullets have commenced laying, it should be gradual, taking at least one week to change over.

In general practice, the evening meal is made up of grain—wheat, maize, or a mixture of these cereals. If it is desired to make a change in the grain ration, this should be done before production commences, or if later, the change should be a gradual process, particularly when grains to which the birds are not accustomed are fed.

Irregular water supply will cause retarding of growth, or affect production; therefore, the pullets should have a constant supply of clean fresh water kept in a cool shaded place.

Pullets being reared in colony houses or temporary quarters should be moved to the permanent houses before they commence laying. The placing of pullets when about four months old in their permanent quarters gives them time to settle down before starting to lay. The

number in each unit is important, because pullets will grow more uniformly and their production will be highest when kept in units of not more than one hundred.

Vices and Ills.

In poultry raising, many vices may develop, and birds may become subject to disease and parasitical infestation because of lack of knowledge. Common results of ignorance or carelessness include:—

Toe Picking.—This is a vice of early life and may commence the first day in the brooder. Hunger, crowded conditions, feet abrasions, and inactivity may be the causes. The remedy is isolation of the toe-picked chicken, removing the offender if it can be found, inducing activity and so keeping the chickens busy. Of most importance is early action to prevent the spread of the vice. The toes of the affected birds may be painted with Stockholm tar.

Feather Pulling.—This bad habit may commence when the chickens are from four to six weeks old, and, if not corrected, may become fixed. It is difficult to correct when firmly established. Confined quarters aggravate the trouble, but it may be associated with malnutrition. Feather pulling frequently leads to cannibalism, as the plucking of the feather sometimes draws blood. Once fowls have acquired the taste for blood they become vicious in their attacks on others. Feather pulling may be checked to some extent by applying a stain to which bitter aloes has been added to the raw part. Providing occupation by frequent feeding of greens and reducing the number reared in any one group may also be effective. For fully grown birds, bran in mashes and plenty of steeped lucerne are suggested. Bran should be used in all chick mashes to the extent of 20 per cent.

Crowding.—Crowding into the corners of the brooder or rearing houses is caused by faulty management. The remedy is in the proper training of the chickens during the brooding stage, and afterwards when the growing birds are being "weaned" from the brooder, or when shifted from one house to another.

Lice, Mites, Ticks, and Worms.

External parasites are evidence of neglect to keep fowlhouses and poultry pens clean and to provide dust baths for the birds. Perches should be painted twice a year with creosote as a precaution against infestation.

Worm infestation is a result of under feeding or improper feeding, dirty runs, and other insanitary conditions—the remedy is obvious.

"CURLED TOE" OF CHICKENS.

Under normal conditions poultry rations contain sufficient riboflavine-rich foods to satisfy the requirements of poultry. Wartime restrictions of foodstuffs with consequent substitutions low in this vitamin have an important influence on the development of "Curled Toe."

This malady has been seen in chickens from two to twelve weeks of age. It is characterised by the sudden onset of leg weakness and curling-in of the toe of one or both feet. In the early stage the symptoms

are not readily seen, but if closely watched the birds will be seen sitting down more than usual, and on moving an intermittent lameness can be detected. In more advanced cases they walk on the hocks, and if forced to move more quickly adopt a hopping gait, making use of the wings to assist progress.

In other respects the chickens appear to be quite normal. Deaths are not common in the early stages.

The inclusion of leafy greens, bran, milk and livermeal, or raw liver in the diet gives very satisfactory results in the early stages. If, however, the disease has been left untreated it may progress to a chronic incurable stage, in which the bird remains permanently crippled. Spontaneous recovery sometimes occurs if the deficiency is not serious.

—P. RUMBALL.

BREEDING FOR EGG PRODUCTION.

In breeding poultry, the farmer should exercise the utmost care in order to establish and maintain a high-quality flock. Considerable progress has already been made in the improvement of breeding practice. Egg production has been increased from about 60 eggs to over 200 eggs per bird per annum, many individual pullets laying over 300 eggs in a year.

In dealing with the egg production in a flock of birds consisting of an equal number of pullets and hens, many authorities quote 12 dozen as a fair average annual production. It is doubtful, however, whether there are many poultry farmers in Queensland who obtain an average production per bird of less than 13 dozen eggs yearly. In some experiments conducted at the Animal Health Station, using White Leghorns purchased from a poultry farmer as day-old chickens, the average production over the two years was 181 eggs per bird, the variations being—pullet year, from 194 to 209 eggs; second year, from 155 to 162 eggs. In these experiments, 116 pullets were used, and the average of the two years was over 15 dozen eggs, and even these birds in their second year laid over 13 dozen. The birds were kept under poultry farm conditions.

The poultry farmer should be able to obtain an average production at least equal to those figures. A constant high average production is only obtainable by good breeding, in conjunction with good management and feeding.

The chief considerations in establishing standards of good breeding are:—Type, constitutional vigour, action, and laying characteristics. Having selected birds reasonably true to type, care must be taken to see that they are of strong constitutional vigour. This is indicated by the vitality, stamina, health, brightness, and alertness of the bird, and is of equal importance to the knowledge of the actual number of eggs laid. As an example, some years ago the first three birds in a laying test laid 302, 296, and 294 eggs, respectively. An examination of these birds at the conclusion of the test showed that the first and second birds were weak in constitution, whereas the third bird was very strong. All these birds were used as breeders, but while the progeny of the first and second hens were disappointing layers, the descendants of the third bird have performed very well in laying tests every year since. That example should emphasise very clearly the necessity for rejecting birds that are weak constitutionally.

Admittedly, it takes courage not to breed from a 300-egg bird. If such a bird produced the eggs without a heavy drain on her body she would be constitutionally strong. If, however, the bird rapidly loses condition during the year, she is obviously weak in constitution and, consequently, would probably be an indifferent breeder. Any bird that is unable to stand up to a heavy season's laying without losing condition cannot be expected to give high-laying progeny and should be discarded, irrespective of other characteristics.

—P. RUMBALL.

ANIMAL HEALTH

Milk Fever in Dairy Cattle.

J. C. MAUNDER, Veterinary Officer.

THIS is a peculiar disease of milk cows in which there is a partial or complete loss of consciousness, paralysis of the hind quarters and sometimes paralysis of other parts. Strictly speaking the disease is not a fever, the general condition is usually the very reverse of hyperæsic.

It is most frequently observed in heavy producing cows whose milk is rich in butter fat. Animals in good condition liberally fed are more often affected than those reared under opposite conditions of management. It is commonest between the third and fifth calving and cows which have suffered from milk fever are liable to a recurrence at subsequent parturitions. It is more common following an easy birth although this rule has many exceptions.

Milk fever may occur either before or after parturition, but the majority of cases take place three to four days after calving. It has been known to occur up to four weeks after parturition.

Cause.

It is now generally accepted that the condition is brought about by a drop in the calcium content of the blood.

Symptoms.

The animal first shows signs of excitement. She may paddle with her feet and bellow. She may stagger, lose balance and fall to the ground. Efforts to rise are generally fruitless. A characteristic attitude is commonly adopted, the cow lying on her brisket, hind feet spread out almost at right angles and the head turned over one shoulder (often the left) and the muzzle pointing to the side. In this position she may snore or groan. In the later stages, the animal may be stretched out on her side. In no circumstances should attempts be made to drench the animal while she is on the ground.

Treatment.

The most recent treatment is the use of calcium borogluconate, which is inoculated under the skin. Two and one half (2½) ounces are dissolved in ten (10) ounces of boiled water which has been allowed to cool to body temperature. This material may be kept on hand for use as required. A syringe and a needle to fit is necessary.

The site for inoculation, behind the shoulder, should be clipped free of hair and the underlying skin swabbed with tincture of iodine.

An earlier and usual method of treatment is the inflation of the udder with a teat syphon and a pump. This milk fever apparatus may be obtained through pastoral supply merchants.

Internal Injury in Cattle, Caused by Foreign Bodies.

A. F. C. OHMAN, Veterinary Officer.

THE swallowing of a sharp foreign body (described as traumatic pericarditis) picked up either from the pastures or when foods, such as bran mash, are given to cattle, in which a nail or piece of wire may be found, because of carelessness or by accident, is not an infrequent occurrence.

Cattle ingest food directly without mastication. In these circumstances, a piece of wire can easily pass with the food down the gullet into the paunch and honey-comb stomach. The danger is particularly likely, when small sharp bodies, such as nails, are swallowed. Larger sized bodies with smooth surface usually cause no trouble to the animal.

The foreign body when passed to the honey-comb may remain there for a time without causing ill-effects. Sooner or later, however, it becomes embedded in the wall. Increased straining at urination, or at time of parturition or abortion, may be regarded as a predisposing factor, which together with the contraction of muscles of the honey-comb wall, may readily fix the foreign body in the wall. The consequences of this will depend on the direction of insertion. Frequently, the nail or piece of wire cuts through one fold of this stomach and lies parallel to the wall, and fixed in this position causes no harm to the animal. Should it be placed more vertically, however, the affection becomes more severe. The foreign body gradually perforates the honey-comb and its further passage may be directed into the abdominal cavity; it may injure the liver, spleen, or, what is more common, may perforate the diaphragm and heart sac, threatening the heart directly.

The condition is not recognised easily, as the symptoms vary in proportion to the damage done by the foreign body. In some cases, it runs an insidious course—the animal losing condition, getting easily tired when driven, and suffering periodical digestive disturbances without any apparent reason. In acute forms the symptoms are more noticeable. The appetite becomes lessened and capricious, the rumination depressed and accompanied by a certain degree of bloat; diarrhoea may follow, the faeces being fluid and dark coloured, due to the pressure of blood, and often bad smelling. This condition may be followed by constipation. The milk yield usually ceases. A marked loss of condition also is evident. The animal frequently lies down and moans; this is also observed when the animal is getting up or being driven down hill. Sometimes a cough accompanied by groaning and also respiratory disturbances may be observed, indicating involvement of the lungs.

Treatment.

As the condition is usually hopeless, no treatment is advised. Early recognition of the trouble is of paramount importance, as the stockowner may get some return by early admission of the beast to the abattoir. It is advised that in suspicious cases veterinary advice should be sought with the view of early diagnosis of the condition.

Bloat in Cattle.

J. C. MAUNDER, Veterinary Officer.

BLOAT is a condition which occurs frequently in ruminants, particularly in cattle, and is often the cause of loss of the affected animal if the treatment is delayed. Cows in poor condition and especially after a period of feed shortage are more predisposed to the condition as they readily ingest large quantities of food, when the paunch and other stomachs are too weak to work with maximum efficiency. This foodstuff, remaining for a good while in the paunch, begins to ferment, leading to a high concentration of gas, which distends the paunch and the honeycomb stomach and the animal begins to show signs of pronounced distress. A large variety of foodstuffs may cause the condition. Ingestion of readily fermentable food, grass cuttings, immature shrubs, decaying vegetation, potato stems and leaves, beetroot or cabbage leaves (if in large quantities), grazing on pastures carrying mainly clover, trefoils (particularly during or after rain), poisons of vegetable origin, nightshade, sorghum, blue couch, and a number of other poisonous plants may cause bloat in cattle.

The disorder in most cases arises suddenly and runs an acute course. At the beginning, the affected animal may not show any sign of sickness. Soon, however, as the pressure on the diaphragm, lungs and heart by the distended paunch is continually increasing, the animal begins to show general malaise, arched back, "colicky" pains, switching of the tail, groaning and lying down. The appetite is decreased, rumination suspended, eructation and regurgitation may occur. The left flank and, as the condition advances, also the right one, becomes considerably distended. Respiratory disturbance is more evident, the respirations are hurried, accompanied by moaning, the eyes prominent and glassy, the pupils dilated, the head is kept low and distended. Finally, if no treatment is applied, the animal falls down and dies in convulsions simply from asphyxia.

Treatment.

In the early stages of the disease, the passing of a probang down the gullet into the paunch may relieve the animal and, secondly, cause the removal of the obstruction in case of "choking." Epsom salts, to which ½ oz. formalin has been added, may be given this way as a drench. Also other measures may be attempted, such as the manipulation of the tongue and throat to cause eructation, a stream of cold water applied over the back and abdomen, and massaging the paunch which will stimulate its action and reduce the concentration of the gas. It is also beneficial to place the animal in such a way that the fore part is elevated, e.g., by the placing of the fore limbs in the feeding trough. This will relieve the pressure on the heart and lungs.

If, however, these measures are, for some reason unpracticable, or the condition has gone too far when marked symptoms of asphyxia are manifest, the only thing to do to save the animal's life is the use of an ordinary trocar inserted over the left flank into the paunch to liberate the gas. Care should be taken to let out the gas gradually, as rapid emptying of the paunch may result in death of the animal.

Stock Poisoning Risks.

MONTGOMERY WHITE.

FAR too many cases of arsenical poisoning among livestock are recorded each year. Most of these end fatally. The tragedy of it all is that these losses can be avoided.

At present, when so many of the hands who used to do the mixing of arsenical preparations are on active service, it is worth while recording for the benefit of those taking their places, the main sources of arsenic poisoning.

Drums, buckets, and tins used for measuring or preparing dipping ingredients should be marked in some distinctive way and carefully placed out of reach of all stock. All left-over arsenic should be labelled and returned to the store or shed. Dips or sprays should be securely fenced off so that, no matter how thirsty stock may be, they will be unable to break into the fatal drink. All arsenic, whether white, grey, or pentoxide, is so poisonous that degrees of toxicity do not matter much.

An idea of the arsenic danger may be gleaned from the following instance:—An owner poisoned some diseased trees. Months later, he admitted stock which ate the fallen leaves. Severe losses followed. When timber or weeds have been poisoned, livestock should be kept out of the paddock, at least until a fire has been through and rains have fallen. In no circumstances should stock have access to pools of water formed in freshly poisoned country.

This brings us to the last precaution to be emphasised: See that the excavation into which discharged dipping fluid is pumped is as securely fenced off from stock as the dip itself.

[*By courtesy, Queensland Country Life.*

Plate 46.

Woodlands Samson.—Junior Champion, Brisbane Beef Cattle Show, 1943, the property of E. E. D. White.

[*See article on p.* 186.

The Brisbane Beef Cattle Show.

THE beef cattle show held at Brisbane, 16th to 18th August, brought record entries. Attendance was good, the judging facilities better than ever, and bidding for classing animals spirited.

Prize winners in all classes were splendid specimens of the breeds. In fact, it would be difficult in any show to have paraded better animals than the prize winners in the senior horned Hereford class. But the tail was present.

Lack of attention because of man-power difficulties and an adverse season—in Queensland at least—were partly to blame for the rough condition of many tail-enders, but poor conformation and unsound constitution have their origins elsewhere. Uneven top lines and too much daylight between bottom line and ground level were noticeable. Even among the older classes many beasts were not sufficiently well let down, and this accentuated the appearance of legginess. A marked all-round improvement in the "set in" of the tail and stream lining of neck into body was obvious. The Shorthorns throughout conformed more to the Scottish type—the hinds being particularly good in this respect. There is still, however, a tendency to pack too much on, in the regions of the less valuable cuts.

The Angus cattle showed two distinctive types—the big-framed, growthy type and the low-set, chunky, "light cuts" type. They were well turned out, and it was disappointing that more buyers were not present.

In past years the soft-handling, mellow hides and sleek coats which come from well-balanced rations containing variety and quality foodstuffs, particularly linseed, were a feature of these shows. This year, all the skill of the grooms and studmasters was taxed to the utmost to "make do" with available foodstuffs and yet produce show animals. Results were a credit to all concerned. There is no doubt that, despite minor faults in preparation, good lessons have been learned.

The incongruous deposits of quickly laid down fat were absent: the "swampy" almost "poddy" appearance that "pap" feeding produces was absent in the youngsters, and most of the bulls old enough for service were turned out in good firm paddock condition, without being either "hard" in appearance or pampered. Most owners were well enough aware of the fodder position in Brisbane and brought their own feed.

It seems truly remarkable that year after year such a collection of able studmasters should meet to exhibit, discuss breeding programmes, compare progress, and buy sires, and yet give feeding a miss—and feeding should be an integral part of their programme.

[*By courtesy, Queensland Country Life.*

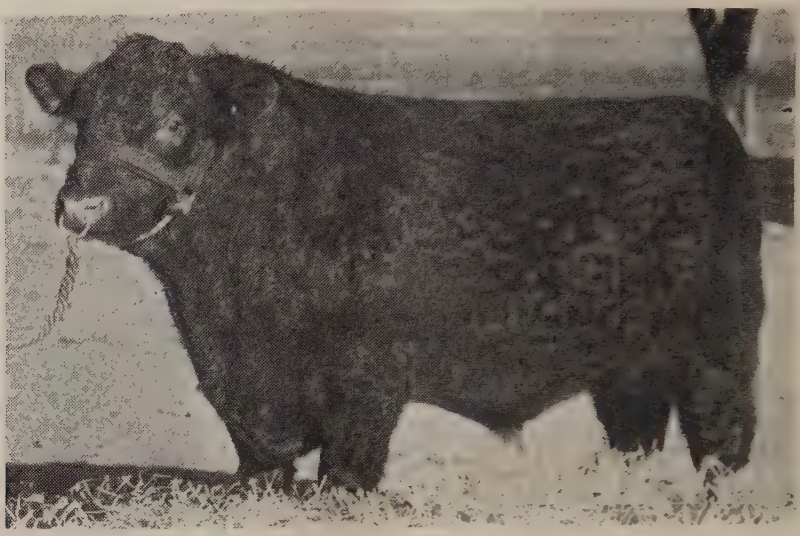
Plate 47.

Hobartville Ringmaster.—Champion Hereford Bull, Brisbane Beef Cattle Show, 1943, the property of P. Reynolds.

[*By courtesy, Queensland Country Life.*

Plate 48.

Booroomooka Leader.—Champion Aberdeen-Angus Bull, Brisbane Beef Cattle Show, 1943, the property of H. G. Munro.



[By courtesy, Queensland Country Life.

Plate 49.

GUNDIBRI STANDARD 32ND.—Champion Poll Shorthorn Bull, Brisbane Beef Cattle Show, 1943, the property of J. T. Scrymgeour.

[By courtesy, Queensland Country Life.

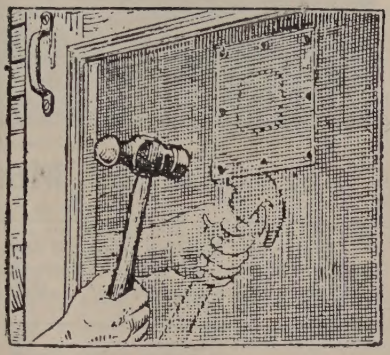
Plate 50.

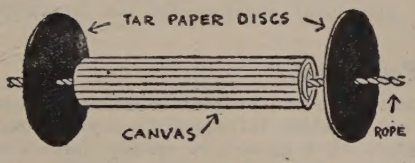
TURANVILLE CORONET 71ST.—Champion Shorthorn Cow, Brisbane Beef Cattle Show, 1943, the property of H. C. and J. C. Taylor.

GADGETS AND WRINKLES

SCREEN DOOR PATCH.

Torn screens in windows or doors can be mended with little effort by ready-made patches equipped with lead fasteners. Select the size patch that will cover the break, press the pointed lead "buttons" into the mesh with the fingers, and then pound them with a hammer to make them grip the wires. If the screen is in place, a brick or another hammer may be used as a pounding surface.



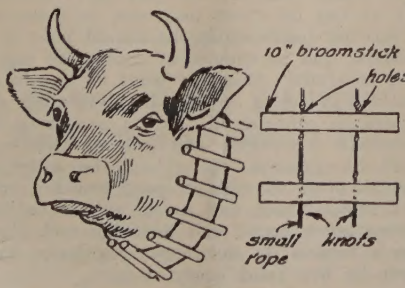


STORING BINDER CANVAS.

When the time comes to store the binder or combine canvasses be sure to put them where the mice cannot get at them. A very simple and effective way to do it is to thread the canvas on a rope with a tar paper disc at each end. Mice will not crawl beyond this barrier.

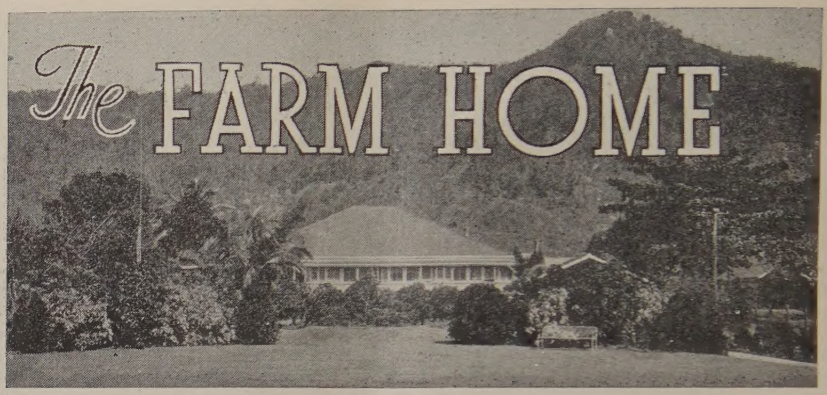
SLOTTED WEDGE NAIL PULLER.

A great improvement over the common practice of using a scrap of wood to push under the hammer head when pulling nails is a slotted wedge-shaped block of hardwood. The block can be pushed under the head to suit the length of the nail.



A MILK PROTECTOR.

Here is a suggestion for breaking a cow of sucking herself: Take a series of round sticks and bore two holes in each stick a short distance from each end. Run a small rope through the holes, knotting it on either side of each stick to hold the wood in place. Place this rope "ladder" around the cow's neck and tie the rope ends.



Care of Mother and Child.

Under this heading is issued each month an article, supplied by the Department of Health and Home Affairs Maternal and Child Welfare Service, dealing with the welfare and care of mother and child.

BABY'S HEALTH: NATION'S WEALTH.

IN discussing constipation in babies, it is necessary to distinguish between two conditions—(1) hard motions and (2) infrequent motions—for the treatment is somewhat different.

The Breast-Fed Baby.

The breast-fed baby is never really constipated, and by that is meant that he does not pass hard motions. But he may pass a motion infrequently—say at intervals of 48 hours, or even longer. The motion, when passed, is usually quite normal. There is no need for a mother to become upset about this condition, and there is certainly no need to give opening medicine.

It is a good plan, provided the baby does not fight against it, to hold him out each morning after he has had his bath and a good kick. The sister at the Welfare Centre will demonstrate how this should be done without discomfort to either mother or baby.

Once or twice a day baby should be allowed to lie without his clothes, or with only a singlet, and exercise his legs and abdominal muscles by freely kicking—for 15 or 20 minutes in warm weather. Do not leave him on the bed to do this or he may fall off. If he lies on a cot mattress, or even a thick rug, he should be quite safe. In hot weather particularly, he should have a few spoonfuls of cool boiled water between meals; and he should, of course, be regularly fed. If a baby does not respond to this treatment, think of what he has to drink, and as most of this comes from his mother, it has to be considered whether she is eating the foods which will cause her milk to contain all that is necessary for baby's health. A lot is heard about vitamins nowadays, and one of these vitamin B—which is specially associated with the general "tone" of the body and helps to keep the bowel muscle as well as all other muscles in good working order. Nursing mothers need an extra supply of this vitamin, and so, as well as eating no white bread, but always wholemeal or wheatgerm bread and porridge and plenty of vegetables, the mother should, if baby's bowels do not move regularly, take one or two tablespoonfuls of wheatgerm in her food every day.

The Bottle-Fed Baby.

Bottle-fed babies need the same treatment—regular feeding, kicking and water between feeds, but with them the condition of constipation is more troublesome, for cow's milk, either fresh or dried, can cause the motions to become very firm until they are passed as a solid mass or in small round lumps like pebbles. The food

may be wrong, and you will be wise to consult the sister at the nearest Welfare Centre about this, as babies cannot all be fed alike and may need a little more fat or a different kind of sugar, or a variation in the strength of their foods.

As giving mother vitamin B will not help in this case, giving it direct to baby may be tried. Add 1 teaspoon of wheatgerm (this is usually sold under trade names such as Cerevitamin, Bemax, or Vita B) to 2 tablespoons of boiling water. Allow this to soak for two hours, then strain through muslin and give the baby one or two teaspoons daily. He may have his orange juice in it if he likes it better that way. Marmite or vegemite, the size of a pea, may also be given to supply this vitamin. Dissolve it in a little warm boiled water and give before the 1 or 2 p.m. feed.

If, however, the condition is of long standing, it may be necessary to give some opening medicine. Standardised paraffin and milk of magnesia are the only aperients which may be used for an infant without medical advice. Whichever is chosen, much depends on the way the medicine is given. If too large a dose is given, or if it is given every second day, or once or twice a week, the irregularity of the bowels is increased, and the constipation may become chronic. The medicine should be given every day at exactly the same time, say a few drops morning and evening, and gradually increased if necessary, until a daily regular action of the bowels is established. Once the bowels are moving regularly, the dose should be very gradually lessened, at the same time continuing with the corrected feeding and the vitamin B preparations. Nothing else should be necessary.

The Toddler.

Sometimes babies become a little constipated after weaning when they have changed over on to more solid food. This can be easily overcome by giving oatmeal or wheatmeal jelly as a porridge instead of barley or rice or other refined porridges, and by increasing their sieved vegetables. Constipation in the toddler is usually a matter of correcting the diet—although it may sometimes be caused by wrong management. Mothers become over anxious about the child's bowel movements and are inclined to fuss or panic if he does not have a motion every day. Nothing could be worse, because a child will sometimes refuse to pass a motion because of the consternation he produces, and he likes to cause a sensation. Sometimes, indeed, a child is so bribed, coaxed or even bullied by an anxious parent that every time he is put on his chamber he makes a scene, kicking and screaming and holding himself rigid. Mothers should never show a child that they are anxious he should pass a motion daily: it should be taken for granted that he will, that it is usual for small boys and girls to do so, and that anyway it is a matter of little importance.

With proper management and the right diet, including wholemeal bread and porridge and a proper amount of vegetables and fruit, constipation should be very uncommon.

Questions on this and any other subject concerning Maternal and Child Welfare will be answered by communicating personally with the Maternal and Child Welfare Information Bureau, 184 St. Paul's Terrace, Brisbane, or by addressing letters "Baby Clinic, Brisbane." These letters need not be stamped.

IN THE FARM KITCHEN.

The Makings of a Square Meal.

Mutton Broth.—1 lb. neck of mutton or mutton bones, 1 tablespoonful chopped parsley, 1 teaspoonful salt, 1 tablespoon barley or rice, pepper, 1 onion, 1 pint water. Wipe meat; chop bones into small pieces, put meat and bones into a saucepan, cover well with cold water, allow to stand for 30 minutes, place on the fire; add onion, salt, pepper (if available), and washed barley or rice; simmer for 2 hours; remove meat, bones, and fat; add chopped parsley, boil for 2 minutes; serve hot.

Neck of Mutton and Barley Stew.—2 scrag ends, or 2 lb. neck of mutton, 4 tablespoons barley, carrots, onions, other root vegetables if desired, flour for thickening, 1½ pints of water. Chop neck of mutton into convenient pieces; place with barley in large saucepan in cold water; bring slowly to the boil and simmer gently for 1 hour. Then add vegetables, salt to taste; simmer for another hour; thicken before serving. Potatoes may be placed on top of the stew and cooked with the same fuel.

Vegetable Stew for Children.—Partly fry a large onion and put into a casserole with several potatoes cut into thick pieces, chop a turnip or parsnip into dice and add some peas—any that are cooked and left over will answer. Season with salt, pepper, and barley; cover with water. A slice or two of bacon may be added, or a few slices of mutton may be put in just to heat, but not to boil. Pearl barley could be used instead of peas, about a quarter of a cup, and it must be soaked overnight. Cook for 2 or 3 hours until it is rich and savoury. Stock or milk may be used instead of water.

Stewed Flat Ribs or Flap from Forequarter of Mutton.—Flat ribs (and the shank as well may be used), 2 onions, salt, and pepper, a bunch of herbs, if liked, 1½ level tablespoons flour, ½ lb. green peas. Cut the mutton into pieces about 2 inches square. Cut away excess fat. Put the sliced onions and herbs into a saucepan with about three-quarters of a pint of water (one and a half breakfast cups). When boiling, add the meat and a little salt and pepper. Allow to boil a moment, and then simmer gently until the meat is tender—two or two and a half hours. Add the shelled peas after the first one and a half hours. When the meat is tender, lift it out and thicken the stock with a little flour blended with cold water, stir till boiling, and boil two or three minutes. Return the meat to the pan, season to taste, and thoroughly reheat. The peas may be cooked separately and added to the stew just before serving.

Breast of Lamb Stuffed and Baked.—Take ½ lb. breast of lamb, 3 oz. breadcrumbs, 1 oz. suet, 1 teaspoon mixed herbs, 1 dessertspoonful chopped parsley, salt, pepper, grated lemon rind, a little milk.

Remove the bones from the meat. Make a seasoning of the breadcrumbs, chopped suet, parsley, herbs, grated lemon rind, pepper, and salt, and bind all together with a little milk. Spread the seasoning down the middle of the meat and make into a roll. Tie this round securely, cover the outside with any odd bits of fat, and bake in a moderate oven with a piece of greaseproof paper over the top. Remove the paper ten minutes before serving. Serve with mint sauce.

Skirt Steak and Savoury Potatoes.—Take ½ lb. skirt steak, ½ lb. potatoes, 1 large onion, small piece of butter, milk, pepper, salt.

Boil the potatoes in salted water with the onion. When cooked and drained put through a coarse sieve. Have ready in a saucepan a little milk, butter, and pepper. Have the liquid very hot, and add the potato mixture. Stir over the heat. Melt a little butter or dripping in a frying pan and brown each side of the steak. Make some gravy after the meat is done by adding a little water, pepper, salt, and a dash of any bottled sauce. Stir and cook for a few minutes. Put the potatoes round the edge of a flat casserole and rough up with a fork. Place the meat and gravy in the centre and put into the oven for about fifteen minutes to brown. Before serving spread a little butter over the steak, also a few drops of lemon juice, and sprinkle with chopped parsley.

Plain Suet Pudding.—One pound of flour, ½ lb. of suet, 1 teaspoon of baking powder, 1 small teaspoon of salt. Chop the suet finely. Sift the flour, baking powder, and salt together, mix in the suet, and pour in enough milk or cold water to make a limp dough. Put into a scalded and floured pudding cloth (leaving room for pudding to swell) or into a pudding basin and cover loosely with pudding cloth, or with buttered paper, and boil for 1½ hours. Serve with treacle, sauce, or golden syrup. It is better to use cerevite or wholemeal flour instead of white flour in these puddings.

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